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SPECTRAL SEAS. ARTS AND THE ANTHROPOCENE: BRIDGING THE CLASSROOM AND THE REAL WORLD TO ADDRESS SOCIAL AND ECOLOGICAL CRISES

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INTRODUCTION

Spectral Seas is a collaborative installation that depicts the scale of future sea-level rise in North Carolina waters in the United States. The project was part of two semester-long courses at Duke University in North Carolina, USA, where a team addressed social and ecological crises, engaging in scientific research and art-making under the theme "Arts and the Anthropocene: Crisis and Resilience in North Carolina Waterways."[1]

The project followed a model that offers an immersive research experience to graduate and undergraduate students, encouraging teams to collaborate in interdisciplinary research with faculty and professionals from different disciplines. These projects bring together a diverse group of academics and students to shed light on a topic of choice in a multi-disciplined collaboration. Our multidisciplinary team spent the academic year meeting with local scientists, artists and environmental activists researching climate change, the Anthropocene, community resiliency and environmental justice. We created arts-based interventions that illuminated and reimagined crises we face in North Carolina regarding water contamination, sea-level rise, increased inland flooding and storm events, all exacerbated by climate change.

For the project to be fulfilling for all participants, it was important to find a topic that interested all of us and that also allowed us to create a course structure that enhanced interaction across the different fields and people involved.

This report shares an overview of our research, the student-led art proposals we developed and the multimodal art installation and StoryMap collection we worked on. It also explores our intention of making a truly collaborative project, the horizontal and vertical integration across disciplines and some of the challenges we encountered along the way.

METHODS

Along the interconnected webs of waterways, coastlines and barrier islands, communities in North Carolina are wrestling with how to plan for and respond to the shifts in our surrounding environment and the corresponding impacts of storm surge, sea-level rise, flooding and contamination. Achieving sustainability and guaranteeing human dignity in the Anthropocene requires collaborative action, diverse expertise and different modes of storytelling. We contributed to this effort by exploring how the arts can mobilise the imagination and moral intelligence of human communities in an era that requires us to reimagine the relationship between humans and the natural environment.

The Arts and the Anthropocene programme explored how visual, theatrical and sonic arts can play a role in educating various publics, provoking action and prefiguring resilient futures in the era of the Anthropocene. Our goal was to figure out how these multiple modes of inquiry might reflect, refract, reference, reinforce or reframe one another.

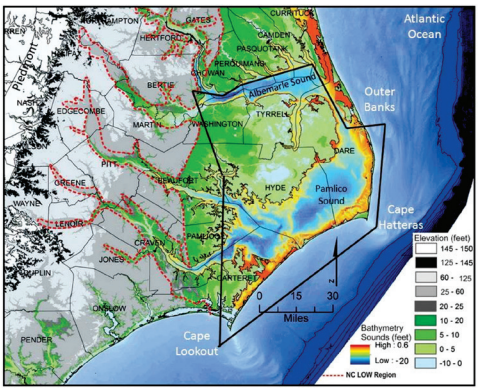

Figure 1. LiDAR (colour topography) map of North Carolina's Land of Water. The black outline area represents North Carolina's vast 'night sky' resource. Created by Stan Riggs and Dorothea Ames.

Figure 2. Photograph by Will Warasila from his first monograph *Quicker than Coal Ash*, published in November 2022 by Gnomic Book.

We started this year-long project in the fall semester of 2020 by examining how scientists and artists have sought to address social and ecological crises and entanglements. We had guest speakers who visited our class for discussions on their research, activism and their art-making. In addition, by reading environmental fiction and nonfiction, we learned about the challenges facing North Carolina waterways and their subsequent impacts on local communities. We covered a variety of issues, from the connection of water and agriculture to the impact of sea-level rise on coastal communities. We cycled through a process of research, creation and reflection, all of which, in turn, demanded new questions. Along the way, we aimed to foster a pedagogical space where the whole team would engage in an inductive collaborative process.

Our guest speakers ranged from environmental and deep-sea scientists to activists, lawyers, playwrights, photojournalists and filmmakers. From river keepers to composers of river sounds, each of our guests taught us new ways of perceiving similar issues related to water, and shared creative tools and ideas for communicating our current environmental crises through art. Throughout, we focused on the role human activity has played in creating these crises, and the role it can play in finding solutions.

Students responded to our research sessions with creative weekly reflections, including prose, poetry, visual art and sound recordings. For instance, one student, Kendal Jefferys, responded to one of the sessions with a painting and a poem.

Figure 3. Kendrick Ransome and Marquetta Dickens in 2019 in the Tar River at Shiloh Landing, where enslaved Africans were brought ashore to be sold to plantations in Edgecombe County. Dickens and Ransome co-founded Freedom Org; Ransome runs Golden Organic Farm in nearby Pinetops, NC, and has family connections to Princeville. Photograph: Justin Cook.

How do we paint in the dark?

How do we paint in the dark?
Monet painted light
watching water lilies
from the same place
light creates new
spaces, stand still
and the world around you
moves
1,000 feet deep
the sunlight dies,
eaten by the sea

How do we paint life
that does not know
our colors?
How do we paint
in the dark?

Figure 4. Art reflection by Kendall Jefferys.

Towards the end of the fall semester, small teams of students turned their inspiration into art proposals. The proposed pieces had the goal of engaging their audiences and provoking them to think deeply about North Carolina waterways and the issues facing the human communities that rely on them for their livelihoods and daily activities.

The following art proposals resulted from this process:

- "In Too Deep" played with photographs by overlaying them with patterns and sculpture to reflect the personal stories of those impacted by rising seas and inland flooding events.
- "The Kitchen" explored the question of what happens to a once-pristine home when overuse of water comes back to haunt its inhabitants. The proposal envisioned an immersive installation with surround-sound speakers, flopping fish and strands of seaweed strewn everywhere.
- "Reimagining Flow" reflected on how to encourage better water use through painting murals, finding community values and exploring innovative ways of gardening in urban spaces via a public installation in Durham downtown, inviting community members to join.
- "Drink Clean" looked at 3D images and video projected over water to present the issue of contaminated drinking water in an exciting, unexpected and engaging format.
- "Spectral Seas" reflected on sea-level rise in North Carolina coastal communities by creating woven sculptures of colourful waves from recycled materials such as plastic bags.

After considering everyone's proposals, the group decided to focus on sea-level rise on North Carolina's coast. We used a colourful graph in the woven wave idea presented by the "Spectral Seas" proposal as the starting point for our work on this installation, but combined it with some ideas from the "Drink Clean" proposal, such as video projection and a focus on contaminated water concerns.

During the second semester, in the spring of 2021, the team started working on the *Spectral Seas* installation, communicating the impacts of sea-level rise on the North Carolina coast. All members of the team undertook further research about sea-level rise while at the same time designing and creating the installation.

INSTALLATION

Spectral Seas is a collaborative installation that depicts the scale of future sea-level rise in North Carolina waters. In this location on the East Coast of the United States, sea levels are already up to 11 inches (28 cm) higher than they were in 1950.[1]

The Tapestry: To assess the impact of sea-level rise on local communities, we researched environmental artists who are responding to the topic of sea-level rise in their own work, as well as artists who utilise recycled materials, trash from the ocean, plastic bottles, aluminum cans and found objects. At some point, our visual research began to focus on water-like and wave-like structures to show the pollution of the ocean and sea-level rise. These ideas formed the basis for the realisation of our project.

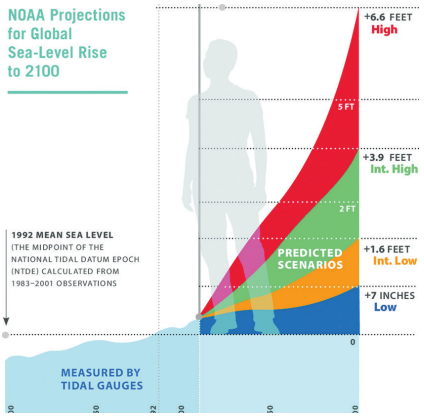

Figure 5. NOAA projections for global sea-level rise to 2100. Inspirational graph from the group Spectral Seas.

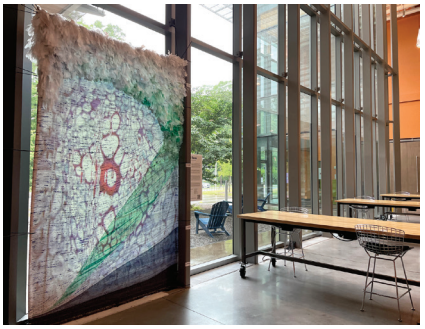

Figure 6. Tapestry installed at the Rubenstein Arts Center, North Carolina.

While researching sea-level rise, some students came across two graphs that show different scenarios, displaying the specific number of feet from moderate to severe sea-level rise. These graphs were instrumental in developing the design of our project. Each student group created different mockup designs to visualise what the project would look like. This gave them another chance to generate individual design ideas. Subsequently, we went through many discussions and iterations, debated different methods and weighed the pros and cons of the different designs until we came up with the final design, a 6 x 7 feet (1.8 x 2 m) tapestry woven from over 400 plastic bags that were collected from the Durham community and processed into plastic yarn (plarn). The plastic bags were a way of repurposing single-use plastics and emphasising that plastic pollution is contaminating our waterways at a disturbingly fast pace, harming wildlife and human health.

Most of the bags were sourced from supermarkets such as Food Lion, and provided a great base, given that they were white and had a little bit of blue on them. Other bags were sourced from friends, recycle programmes and trash containers. We also used dark grey plastic bags from Walmart and light green bags found at the vegetable section in supermarkets. Colour played a large role throughout our planning and the creation of the weaving. The colour palette represents the NOAA (National Oceanic and Atmospheric Administration) sea-level rise prediction for 2100, with scenarios of severity from moderate to severe. The grey area represents the lowest prediction, 7 inches (18 cm) of additional sea-level rise, which would require an immediate reduction in global greenhouse gas emissions. The light green section represents over 6 feet (1.8 m) of sea level rise, the highest prediction. Some bags were dyed to achieve the colour palette we needed. Pompoms at the top of the tapestry represent a cresting wave breaking over the population and the land.

Projection Mapping: We investigated the use of projection to help tell a deeper story and complement the weaving, adding movement to the texture of the tapestry. We thought about how thematically we could portray the impact of sea-level rise on humans, wildlife, urban environments and forestry.

For our collaboration, the main challenges were, first, to make sure each person's individual style came through in the video, and second, to link the resulting individual sections with seamless transitions to make the video cohesive. The team thought extensively about colours, textures and transitions that evoked emotions and their experiences with nature, in order to create a compelling narrative and immersive imagery for the viewer. We used warm colours in contrast to the cool colours of the tapestry.

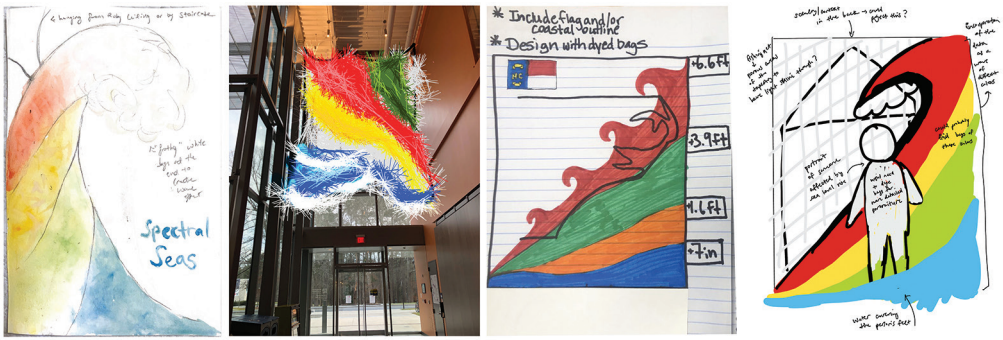

Figure 7. A selection of sketches created by different members of the team.

Figure 8, 9 & 10. Weaving iterations and design mockups. Photographs: Raquel Salvatella.
Figure 11. Weaving team showing examples to the audio and video team via Zoom due to COVID restrictions.

The **video**[2] starts with wildlife scenes, depicting animals which live on the Outer Banks of North Carolina and which are impacted by sea-level rise. It then moves to imagery of grasses and life-sustaining mechanisms in forests along the shoreline, towards waves where it gradually zooms out. The water ultimately becomes a hazard, through flooding, water contamination and mould, as the images transition to a more urban environment portraying the consequences of water rising. By incorporating images and movement, the video projections add another textural layer to the installation. Lapping waves, shadows of human figures and photography from the Outer Banks aim to portray the impact of sea-level rise on humans and the environment. We hope that the video allows the audience to understand the immediate problem while thinking about future possibilities to mitigate the impact of sea-level rise.

Figure 12. Selected frames from the video animation.

Figure 13. Selected frames from the video animation.

The **soundtrack** for the installation is composed of field recordings made above and below the water surface along the North Carolina coast. We were able to use recordings from PhD candidate Will Cioffi who does research at the Duke Marine Lab, and a couple of team members were able to record sounds of the rising tide flowing into a saltmarsh. They captured the sounds of waves breaking onto sand, as well as birds and insects singing in the distance. Hydrophone recordings of humpback whales and dolphins and various fish species became a key component of the mix. The goal of the audio was to evoke the beauty of underwater sea life, the quiet tide of the saltmarsh, the restlessness of crashing waves and the impending threat that sea-level rise poses to ecosystems.

Figures 14 & 15. Students working with sound.

The exhibit: The exhibit opened on Earth Day, 22 April 2021, at the Rubenstein Arts Center in Durham, North Carolina. Since it was indoors, and unfortunately, due to COVID, it was only open to viewers from the Duke community. One of the goals of this installation was to support activism through our art piece by creating an atmospheric, emotional connection between the viewer and the seashore, and by sharing stories and warnings about what is happening regarding climate change and sea-level rise on the coast of North Carolina. Since we aimed to engage a broader audience, we also created a virtual opening, to which we invited all the guest speakers who participated in our class during the academic year, as well as anyone from the Duke community and beyond who wished to join. We shared our research, experience, StoryMaps[1] and a five-minute video piece that portrayed the installation for those who could not physically see it. The virtual opening provided an opportunity to showcase the work, not only at the local level but also internationally, reaching viewers from various locations across the United States and around the world.

MAKING STORYMAPS:

In order to share our project in both a narrative and visual way, the team used ArcGIS StoryMaps, a digital web-based application that can easily combine text, interactive maps and other multimedia content.

We set up different teams to develop the StoryMaps. Each team focused on a specific topic ("The Science of Sea Level Rise," "Local Impact") and our learning process throughout the year, as part of "Bass Connections," the "Art Installation" and "Our Team." One of the goals for the StoryMaps was to deliver more content to audiences than the final art installation could achieve. We wanted to capture all the research and work behind creating the exhibition, and make it available online.

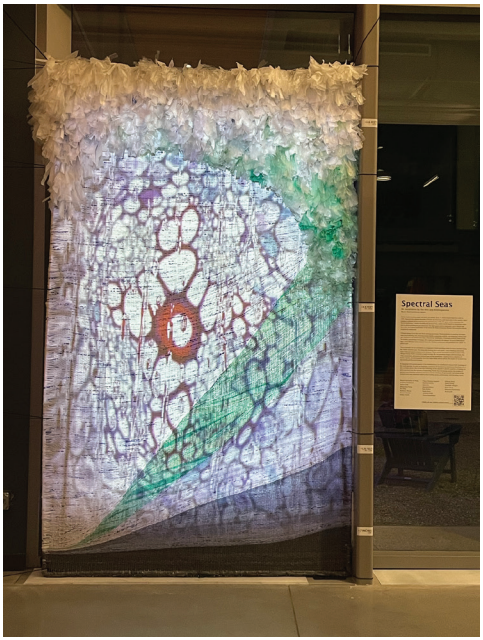

Figure 16. Art installation.
Photograph: Raquel Salvatella.

Figure 17. Flyer to advertise the virtual event and installation.

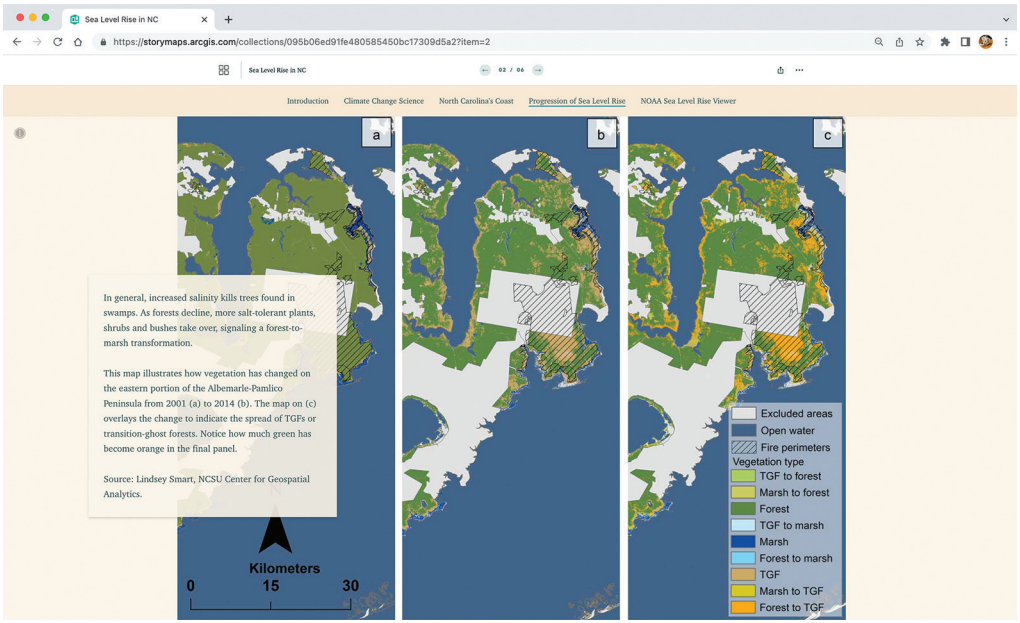

Figure 18. Partial screenshot from the section "Effects of Sea Level Rise" within the StoryMaps. https://storymaps.arcgis.com/collections/095b06ed91fe480585450bc17309d5a2?item=2

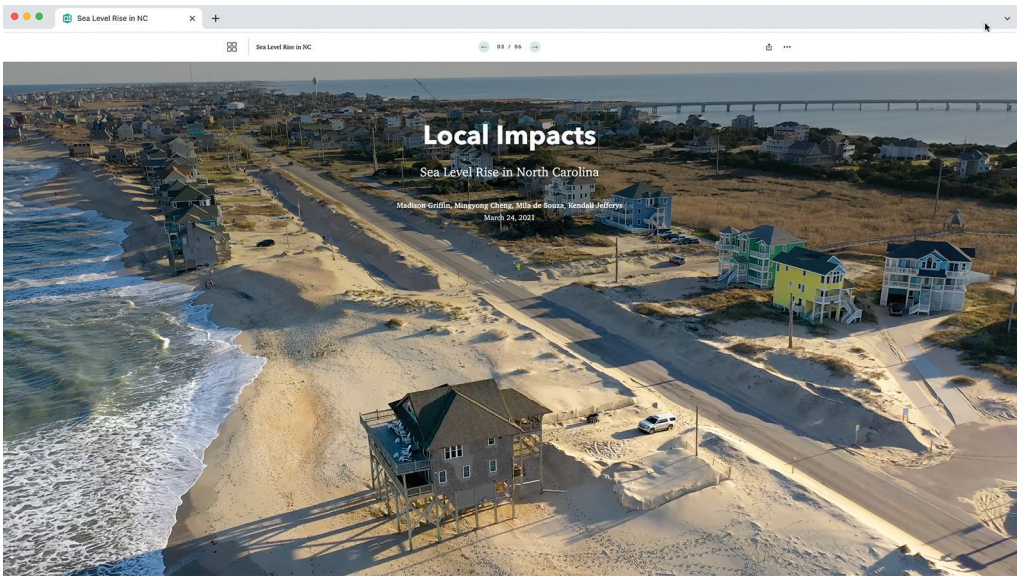

Figure 19. Partial screenshot from the section "Local Impacts" within the StoryMaps. https://storymaps.arcgis.com/collections/095b06ed91fe480585450bc17309d5a2?item=3 Image from a video frame by Justin Cook.

The Science of Sea Level Rise presents a scientific perspective on what sea-level rise means, why it matters for human beings and what effects it has on the North Carolina coast, not only on humans but also on the natural ecosystems. Students researched the tensions between short-term and long-term solutions by looking into resilient structural and non-structural coastal solutions, policy and planning, both from an engineering and design perspective and from a planning and policy perspective.

Local Impact describes how sea-level rise affects our local communities. Interactivity allows zooming into a specific location to explore different local stories.

Figure 20. Arts and the Anthropocene Bass Connections team.

Bass Connections describes what we learned throughout the academic year and how it helped us better understand the connections between science and art. It includes our research process in a class environment, a selection of reflections on the guests' visits, summaries of the books we read and the art proposals students created.

Our Team shows the various contributors to the project. This was a team of students with diverse backgrounds and expertise. We were able to have a fully interdisciplinary collaboration.

Spectral Seas installation goes into more detail about the creation of the installation which I described above.

CHALLENGES

Arts and the Anthropocene was an ambitious teaching project which tried to achieve integration across disciplines and amidst the pandemic. Horizontal integration involved many experts from different fields, while vertical integration involved undergraduates, MFA, PhD students, faculty and professionals, all in one team.

We had undergraduate students whose majors included international comparative studies, environmental sciences (marine biology, marine science and conservation), environmental engineering, environmental science and policy, English, cultural anthropology, intersectional sustainability and fashion, visual & media studies and visual arts. We had graduate students in environmental management, marine science and conservation, art history, experimental and documentary arts and ethnomusicology; faculty members from the School of Environment, Art, Art History & Visual Studies; and members of the local community who are photojournalists and artists.

Some of the challenges we had to address were:

- How to communicate one of the challenges of North Carolina waterways (sea-level rise) to an audience
- How to address a real problem that was close to our hearts through art
- How to achieve this by integrating different disciplines and levels of expertise
- How to deal with the restrictions at the beginning of a pandemic when we were not sure what would happen even days into the future, for instance, with regard to field trips to collect data and video and sound recordings
- How to encourage students to collaborate when they are often unwilling or not used to it

What made our team and project unique was that we managed to give every member of the group intellectual ownership of the final project. Each and every one contributed and could identify with the installation. An important step was the discussion that led to the selection of our project. When we formed the team, we did not yet know what we could produce. In addition, the project allowed us to create a course structure that enhanced interaction across the different fields, and between people and their expertise, so that everyone could contribute and not feel like they were just helpers. Collaborations can sometimes mean that students do the footwork and don't contribute intellectually, or that faculty advise and mentor students on creating a student project. In contrast, I think we managed to create an interdisciplinary and collective project integrating everyone, without much hierarchy.

When preparing for this class, the original plan was to gather materials by making two research field trips in North Carolina, but we were not able to do that due to COVID. At the same time, we were able to redirect our funds to bring more speakers than initially planned to the classroom via Zoom. This change enriched our experience throughout the fall semester, even though we spent it entirely in remote learning mode. Having to do everything online was a significant challenge, especially trying to build relationships to work on a collaborative project. The class met once a week for two hours and thirty minutes, and that amount of time over Zoom was exhausting for the students, even with breaks.

The spring semester also started over Zoom, still remote, working on design mock-ups and brainstorming the installation. Not having seen everybody face-to-face made the second semester more exciting when the time came to finally do so. When we could meet physically, we worked in small groups initially, and bigger groups when restrictions eased slightly. We also tried to meet outside as much as possible. COVID was a challenge throughout the collaborative process, but it also provided unique opportunities. For example, since artist residencies were not running, we were able to reserve a painting studio space just for this class, so we could leave work in progress on location and have students come to weave whenever they could. Creating a scheduling structure where students could sign in in small groups to work on the tapestry and create plastic yarn was crucial, since only one person at a time (sometimes two) could be weaving the tapestry.

Eventually, time became essential. We had to ensure that we were getting everything done in time for the installation to open on the arranged day. Fortunately, everyone felt responsible for our ultimate success and worked hard in the final weeks to complete the art project and StoryMaps.

Figure 21. Students Sarah Kelso (left) and Kate Kelly (right) weaving.

Figure 22. Students Alison Rosembaum (left) and Kate Kelly (right) creating plarn (plastic yarn).

Having all these different components in the project made efficient organisation a central concern. We used a tool called RACI Matrix, which is a diagram or chart that shows the list of project tasks and the persons who are Responsible, Accountable, Consulted or Informed for each task.

When designing the installation, we initially hoped to create it as an outdoor exhibit so that COVID restrictions would not be too difficult to apply. Still, multiple factors such as weather conditions (strong winds and rainstorms), wildlife possibly getting entangled in the mesh, inexperience with outdoor sculpture and space availability pushed us to move the installation indoors. The artwork evolved correspondingly to accommodate the space available and the skills of the team.

Even though we mitigated the impact of COVID restrictions, the engagement of the local community was still limited compared to what would have been possible if they had had the opportunity to visit the installation and engage more intimately with the topic of sea-level rise at a local level. Local issues and possible solutions are not as commonly understood as one might think. We could have also involved the viewers by organising a workshop that explored rethinking plastic contamination and the use of plastic in our everyday lives through the creation of woven items using plastic yarn.

The project was a genuinely collective effort, and the group experience, though more limited than it would have usually been, was perhaps more valuable to all of us at a time when social isolation was the norm.

Figure 23. Arts and the Anthropocene Bass Connections team.

Figures 24-25. Tapestry details. Photograph: Robert Zimmerman.

Figure 26-27. Tapestry closeups. Photograph by Raquel Salvatella.

CONCLUSION

Arts and the Anthropocene saw scholarship blossom into art and lead to activism. There is something special about this kind of interdisciplinary collaboration, where one can be surprised by how people's ideas run into each another and spark ways of thinking about something that one may not have imagined.

We took advantage of being remote by hearing so many speakers from all over the country who did not have to travel to Durham to speak with us. We were able to produce our multidisciplinary project, even during the pandemic, thanks to the flexibility of the university facilities, but also because we are surrounded by colleagues, students of all levels and experts who are motivated, love what they do and were able to contribute to this project. We all learned things that we would never have learned otherwise. We did not just explore other people's art, but we created something beautiful of our own.

We were fortunate that students were willing to engage in this very open process. Of course, a team project compels all participants to move forward together, and this means that some students feel rushed while others could work even faster. This led to ups and downs in motivation for some. As a result, students did not contribute equal amounts of effort or output to the many time-consuming tasks that had to be performed, and understanding and accepting this is a useful lesson about teamwork. In the end, the important thing was that everyone – students, faculty and outside collaborators – was able to contribute, not just their skills and time, but also their interests and views.

Raquel Salvatella de Prada is an artist and educator who focuses on integrating computer animation and motion design with different traditional art forms by collaborating with artists of diverse backgrounds. She finds that the combination of her digital medium with physical visual media can be a powerful way to communicate social issues. Her work and her collaborative performance pieces have been featured at festivals and on stages across the country and internationally.

Jonathan Henderson is a multi-instrumentalist active as a musician, producer, writer, and educator. He has produced recordings in the US and Senegal, created music and sound art for film, theater, and art installations, and regularly performs on the street and the stage. Jonathan holds a Ph.D. in Ethnomusicology from Duke University and is a Professor of Music at College of the Atlantic in Bar Harbor, Maine.

Acknowledgements

This essay draws on the presentation the Arts & The Anthropocene team gave during the virtual opening of the Spectral Seas exhibit. Team Members: Elizabeth Albright, Chaya Brennan Agarwal, Mingyong Cheng, Will Cioffi, Justin Cook, ;Mila de Souza, Ke Ding, Kendall Jefferys, Madison Griffin, Joyce Gu, Kate Kelley, Sarah Kelso, Ayesham Khan, Lizzy Kramer, Kathleen Mason, Mark Olson, Jessica Orzulak, Alison Rosenbaum, Hillary Smith, Jessica Wang, Donovan Zimmerman.

1 "Overview: North Carolina's Sea Level is Rising: And it's Costing over $2 Billion," https://sealevelrise.org/states/north-carolina/ (accessed 5 July 2023).

2 Video of the installation: https://vimeo.com/543210487

3 StoryMaps: https://storymaps.arcgis.com/collections/095b06ed91fe480585450bc17309d5a2