STEAM
PLANT

Fostering interdisciplinary collaborations

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Team Members

Ami Cai

Creative Director and Lead Designer

Student in Communications Design

Basem Aly

Game Management and Production Director

Associate Director of Research and Strategic Projects and Professor for Interactive Services

Christopher X Jon Jensen

Scientific Research and Game Design Consultant

Professor in Math and Science Department

Jennifer Telesca

Political Strategist

Professor in Social Science & Cultural Studies

Sarah Meadows
Lead Programmer
Game Developer

Grant Ng
Team Coordinator

Alycia Hinrichsen
Design Research

Joey Pagano
Lead 3D Modeler
Game Market Consultant

Jooyoung Park
Graphic Designer

Alicia Mota
Editor

Conor Behrens
Programmer Consultant

Austin Snyder
Programmer

Michael Poirier
Programmer

Veronika Kostova
Web Designer

Mark Denardo
Sound Design Consultant

Purpose Statement

The purpose of Song Searching is to create awareness of the direct effects of noise pollution on the lives of humpback whales in a way that is easily distributed. The interesting thing of noise pollution is that once we stop, it's gone, but it is still harmful even though it can't be seen.

Once part of the symbiotic environment is disrupted, there are larger snowballing effects that are too complex to track and emulate, but this game is meant to be the first step into research. It's meant to inspire people to do what they can, by seeing and experiencing its effects as a whale.

The interesting thing of noise pollution is that once we stop — it's gone.

Concept

"Some whales, they live up to be 150 to 200 years old. When those whales were teenagers, the world was quiet."

- Christopher W. Clark

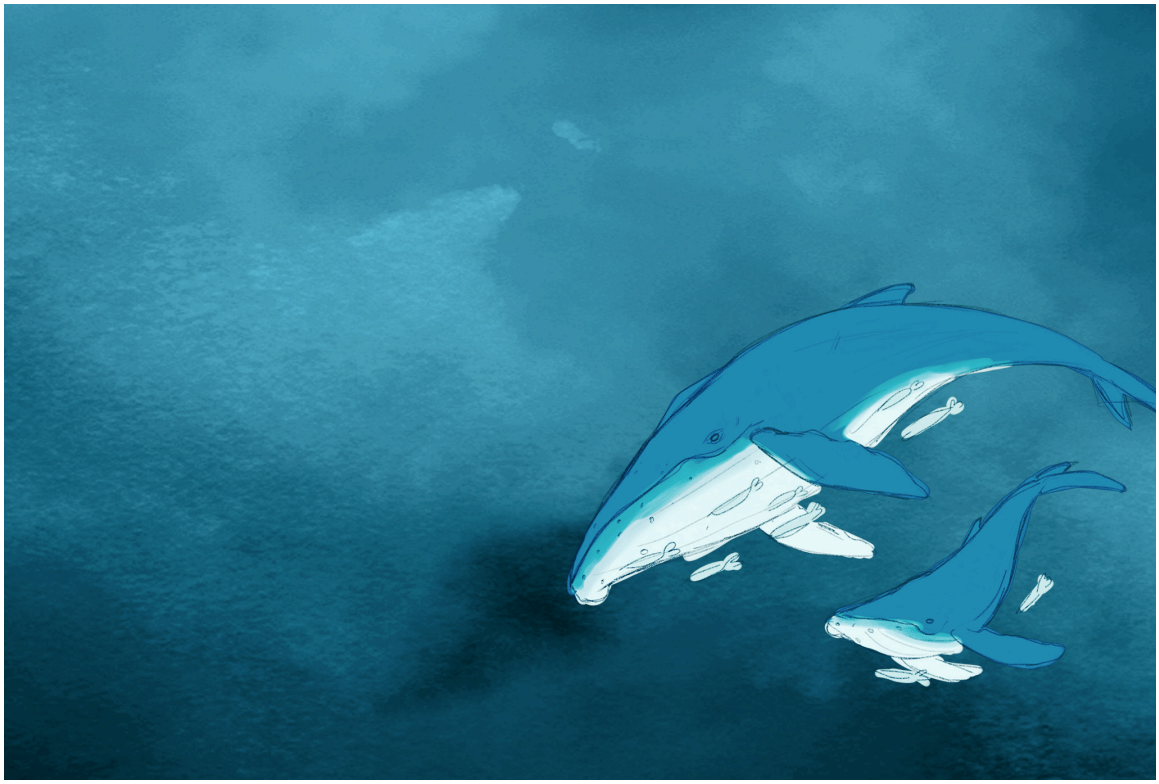
Song Searching is a video game that has no linguistic dependencies. It's meant to be understood by and relatable for everyone, whether the player is a parent or child, Chinese or American, and anything outside and in between. Learning to communicate with those around you is a fundamental aspect of the game. Instead of focusing on visuals, which us humans rely on heavily as our second method of communication, we designed the game to have low-poly art in order to rely more on composition, context, and audio just as a humpback whale does. This allows for more layering of information without overwhelming the player with intense visuals. When the scene is soothing and diverse, it can be a beautiful and natural symphony; and when the scene bears the havoc of noise pollution, it interrupts and causes chaos in the natural soundscape.

Research is presented as a game so that anybody in any age can have an empathetic experience. Hands-on. This day and age is focused too much on entertainment and storytelling. You can go back to the fundamentals of empathy. No language means that anybody from any background can enjoy the game to its fullest. When you have a video game, not only does the player control the character, the player is putting themselves and living that life of the character. HB whale as the character, we have the player completely experiencing this lifestyle from beginning to end. To do that is not just to do a comic or novel or anything like that. It's to have the players visually and audibly experience that lifestyle. Making research digestible for anybody.

Purpose of low poly art and sound — ideal combination where the visuals

become less important. With less focus on the visuals, you focus more on the audio. We're also in a time of minimal modern design, so the geometrical aesthetics of low poly pair well with modern trends. The goal of design is to minimize details and basic shapes to focus more on the composition, colors and space. With low poly models are cheaper and easier, less details to focus on and fundamental shapes and geometrics.

Sound design is not only a design element but actual representation of sounds in the ocean, the design of the sound is layering and prioritizing which sounds should be focused on. Focusing on the sound environment and the players experience of that sound. A lot of it is having the player be in the moment of where sound affects them. Where you have sound normally where it is soothing and diverse, where it is layered, it can be become a beautiful and natural symphony. And letting the player experience the havoc of noise pollution and interrupts and causes chaos and becomes frustrating, where sound becomes so obnoxious that you just want silence. Leading to the feelings of these marine creatures where they've gone to the point where they just want silence. So storytelling through audio rather than through visuals and language.



Research

Pollution

When referring to noise pollution, it separates into two different categories - land noise pollution affecting humans and marine noise pollution affecting marine life. I've definitely heard of the predicaments and hazards of how noise pollution affects people who live by wind mills and those who grow up living in busy cities. When I had began my research on marine noise pollution, I was discovering many of the many sources.

Shipping Boats

The most common source of noise pollution are commercial shipping boats (also known as cargo ships) emitting a constant vibrations of sounds created by contraption. With 98% of the world's goods being shipped oversea, estimations of 60,000 commercial boats constantly around at sea. These ships aren't small either, some of the container ships are massive — comparably the size of the Empire State Building.

One of the best resources to see live mapping of ships at sea is at **www.marinetraffic.com**, all the legal ones anyway.

Seismic Surveys

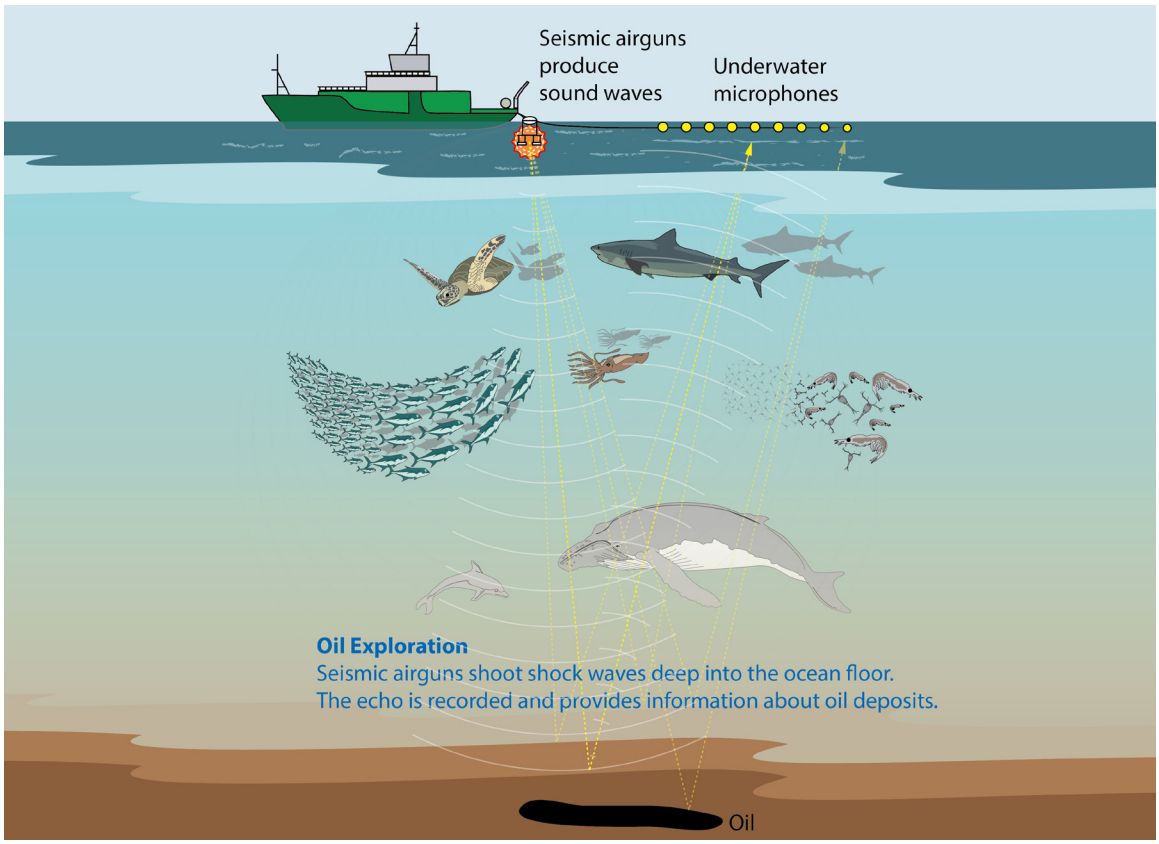
One of the many facts about ocean oil exploration that isn't commonly known are the airguns used during seismic surveys. Though named air "guns," the sound they emit is accurately more compared to bombs. These large explosions of sound fire not only once in a while but countless times. Known to fire off every 6 to 10 seconds for months — creating a hell-scape of sounds

Military Sonar

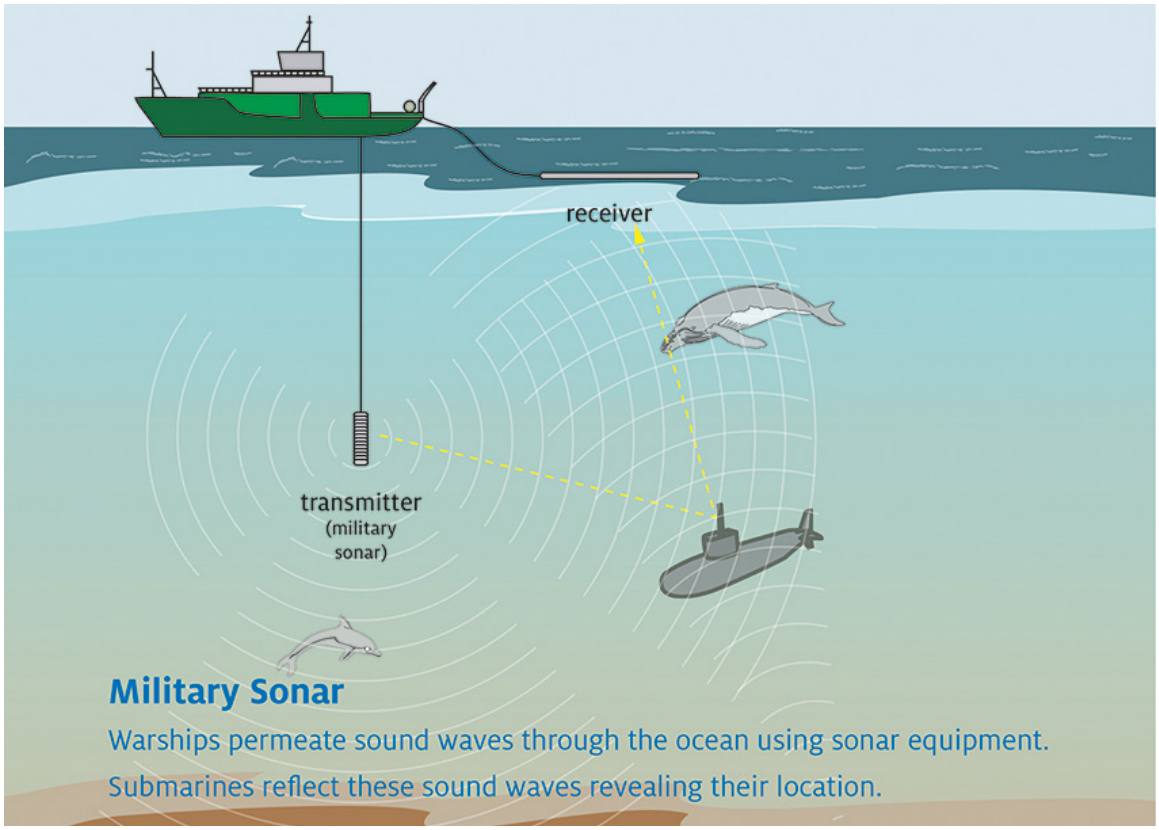
The principal submarine detection system used by naval forces are the extremely loud waves of sound sweeping the ocean — sonar. The military sonar systems act as a huge predator towards marine life. Marine creatures have been recorded to go silent, stop foraging, and even abandon their homes. Many mass whale strandings have been sourced from repeated exposer to sonar.

Other Pollutants

Humpback whales don't die from other pollutants as easily as they do from entanglements, left over remains of fishing nets. While on route, or at feeding grounds, there will be floating nets that are hard to see and come into your vision suddenly. This will cause the whale to slow down immensely. Over time, human fishing efforts will reduce food availability, making it harder to get enough food.



Diagrams provided by Ocean Care



Cross-species Interaction List

Types of interactions and their potential application to the game design supplied by *Chris. X. J. Jensen*.

1.) Sound pollution

Definition of interaction

Humans create “sound pollution” from a variety of sources, including:

- Seismic surveys
- Ship traffic
- Military sonar

Goals

Avoid sources of sound pollution that cause damage to hearing and interfere with the ability to hear important sound cues in the environment.

What the player learns

- Because humpback whales use sound for both communication and to assess their environment, sound pollution can make it harder for them to survive and reproduce.
- Because humpbacks are very social creatures and their singing serves a variety of social functions, sound pollution can disrupt their normal social interactions.
- In order to take advantage of sound as a source of information, whales have evolved very sensitive hearing. This crucial sense can be damaged by very intense marine noise.
- Extreme marine noise can lead to strandings, which occurs when whales surface too fast to avoid the source of noise.

Worst Scenario

- A player who is exposed to a high level of noise may suffer hearing damage that impedes their ability to sense sound cues that are critical to succeeding in the game.
- A player that tries to avoid a noise source may be more likely to become stranded in shallow water, which could lead to death.

2.) Other pollutants

Definition of interaction

- Microplastics are found areas where whales frequently filter-feed. The effects of microplastic ingestion are not well-understood in whales, but it is reasonable to surmise that they could be exposed to leached toxins when microplastics pass through their gut. Microplastics may also decrease the efficiency of feeding.
- Where Humpbacks migrate, they are likely to encounter marine plastic aggregations
- Oil spills pose a threat

What the player learns

- The ocean is a place where a variety of pollutants aggregate, including macroplastics, microplastics, and a variety of toxic pollutants
- Whales can be harmed by some of these pollutants; others are simply obstacles to be avoided.

Challenges

- Players can encounter various forms of pollution as they migrate through different regions of the ocean
- Some forms of pollution are just obstacles to avoid (but not actually cause harm), such as large aggregations of macroplastics
- Other forms of pollution can degrade the health of the whales
- Microplastic aggregations in feeding areas that interfere with filter-feeding

3.) Conspecifics : competitive groups

Definition of interaction

- Humpbacks form competitive groups that are composed of multiple males who compete to mate with a single female
- Males use songs to mediate their interactions

Goals

- Player as male: Modify your song to show a complex and highly-varying repertoire
- Battle with other males with increasing levels of complexity and variation

What the player learns

- Song is used by males to assess each other in ways that are very similar to songbirds
- Rather than engaging in direct conflict that would be potentially injurious or even deadly, whales use song to assess their competitors and establish which whales can hold particular territories

Challenges

- Increase your song repertoire in order to maintain a good-sized territory
- Hold onto your territory for long enough to gain some mating opportunities

Worst Scenario

Singers will lose their territory and therefore lose out on mating opportunities

Interacts with Sound Pollution

The ability of males to interact with each other can be disrupted by noise pollution

4.) Conspecifics: mating

Definition of interaction

- Males sing to attract females
- Females with calves may experience some threat from males who seeking mating
- During the breeding season adult males pec-slap before they disassociate with a group of males that are vying for a female, whereas adult females pec-slap to attract potential mates and indicate that she is sexually receptive. Its function between mother calf pairs is less well known but is likely to be a form of play and communication that is taught to the calf by the mother for use when it is sexually mature.

5.) Conspecifics: parental care

Definition of interaction

Humpback mothers nurse their offspring for 5-6 months and then provide another 6 months of non-nutritive care

What the player learns

- During their first year of life, humpback calves are very dependent on their mother for nutrition, protection, guidance, and social learning.
- Humpbacks learn their migratory route from their mother.

- Sound pollution can be challenging to humpback mothers, who use sound signals to maintain contact with their calves.
- Predation from orcas is a threat to calves
- Aggressive males, who try to mate with the mother, can be a threat to a mother and her calf (See above)
- Pec-slapping varies between groups of different social structure, such as not occurring in lone males but being common in mother calf pairs and also when they are accompanied by an escort.

6.) Conspecifics: cooperative feeding

What the player learns

- Cooperative feeding allows humpbacks to more effectively hunt small schooling fish than could be accomplished alone.
- Cooperative feeding is only effective if all members of the feeding group work together in unison. Any lack of behavioral synchrony — or "cheating" to try to grab the prey first — leads to loss of prey.
- The benefits of cooperative feeding are in part maintained by social sanctions: a whale who fails to synchronize with others — or who cheats — will be rejected as a future social partner.

Challenges

The player must read the signals from other whales and synchronize their movements in order to effectively capture prey.

Worst Scenario

- When a player fails to synchronize -- or who cheats — will end up being rejected from the group.
- Failure to effectively feed cooperatively lowers the amount of food available to a player, potentially leading to starvation.

7.) Conspecifics: migrating in groups

Definition of interaction

Juveniles and females without calves arrive first, then the males and females with calves

What the player learns

- Humpbacks travel in pods
- Humpbacks use sound communication to maintain contact with members of their pods
- Migration allows humpbacks to alternate between ideal feeding grounds near the poles and ideal breeding grounds near the equator

Interacts with Migration : boat traffic

8.) Solo Feeding

What the player learns

- Humpbacks may use their sense of smell to locate krill
- Migration : geographical boundaries

Goals

Player learns whale migration patterns

Challenges

The player must find a safe migration route while avoiding swimming into shallow waters.

Worst Scenario

Players who fail to avoid close proximity with coastlines may end up being stranded, which usually leads to death.

9.) Migration : boat traffic

Goals

- The player is trying to migrate on a path that minimizes interaction with boats and avoids collisions
- Player as female with calf: Same as above, with the additional challenge of keeping her calf on a path that avoids collisions
- Player as calf: Needs to stay close enough to mother to gain her guidance in avoiding collisions with boat traffic

What the player learns

- Boats represent a serious source of both marine noise and collision risk.
- Whales may have to expend extra energy avoiding boats and the noise they produce, which can affect their ability to survive their long migrations.
- Whales potentially lose sources of information about their environment — including the location of shorelines and of social partners — due to marine noise.
- As boat traffic has increased in both frequency and scale, whales face an ever-more-challenging marinescape.

Challenges

- The player has to maneuver around boats to avoid collisions and damage to their hearing.
- The player has a more difficult time hearing sound signals from other whales and from the environment when boats are in the vicinity.

Worst Scenario

- The player dies or gets injured from a boat collision.

Interacts with Conspecifics: migrating in groups

10.) Non-threatening: Dolphins

Definition of interaction

Whales appear to tolerate the playful interaction of dolphins, who like to surf on the wake of a humpback

What the player learns

Interactions with dolphins are not based upon necessities or reliances, but simply out of luxury / enjoyment.

11.) Threatening: predators

Definition of interaction

Orcas try to separate calves from their mothers; mothers and calves "whisper" to maintain contact but avoid detection from predators

Goals

- Player as female with calf: The female must keep her calf in close proximity when orcas are on the prowl, but she also needs to use quieter signals to keep her calf nearby to avoid attracting the attention of orcas. In the case of an orca attack, the mother must position herself in a manner that prevents orcas from attacking her calf.
- Player as calf: The calf must respond to its mother's whispers and remain in reasonable proximity to avoid getting separated, which would increase its vulnerability to an orca predation. In the case of an orca attack, the calf must stay close to its mother, making sure that she can shield it from an orca attack.

Game Development

1. Heuristics: enabling a person to discover or learn something for themselves.

The player experience has been designed so that all the elements of the game feel natural, inspired by heuristics.[1] By losing focus on necessities of dialogue and text in games, the player can focus on the aesthetics and design. The colors and sounds work hand in hand, giving the player a sense of context and mood.

I couldn't be designing and formating a game if I didn't personally play games myself. Other games that I've been able to play that are phenomenal examples regarding an approach to game design.

Monument Valley (series) - A very popular and award winning app, it specifically works with simplified geometric shapes and colors. Its game mechanics are simple and understandable. The player enters the game with a puzzle to teach the player there are only two mechanics: click and rotate. Once completed it plays the title card animation.

When a game is designed to be played in a simple mechanic, there is a flexibility for its design.

ABZÛ - Unintentionally, ABZÛ is the most similar game that resembles the aesthetics and narrative to *Song Searching's* game design. Though it wasn't a big influence in the creation of *Song Searching*, ABZÛ supplies an extremely strong and commercially successful example of a non-narrative game. ABZÛ introduces the main character lost in the middle of the ocean, then with the player's console projected above, they highlight a button and in simple light text, "press to dive".

Why is the playable character a whale and not a human?

Majority of video games have a humanoid for a main character; they're easy for us to understand their mechanics and abilities, so much to the point that we even get disappointed when they're unable to perform actions we, ourselves, are able to do.

It's not unusual to have main characters that are non humans, but they're not as common. The main character is a humpback whale because humpback whales are a unique species that interact with a variety of different species in the ocean. Many cases of humpback whales rescuing or helping other species, even humans, occur away from danger. A creature of such empathy and capability for interaction are a beautiful focal point for the player to experience the ocean in a game format.

Aesthetic Design

Color schemes

The main propositions regarding color schemes were designed to focus on the environmental experience as a player. There were various possible options, much research was devoted to what colors of blue are commercially used in Pantone Colors. What kind of colors were referencing the different parts of the ocean? This gave an idea regarding how certain depictions of the blue can vary. The selected blues were then put into reference for making up potential level-design color schemes, which gives a very contrasting and exciting element to every level.

Many of the colors chosen for the game are distinctive water colors off the shores of different coasts, which are different. Greener waters contain more phytoplankton than waters that are bluer in color. So, by having the elements of different colors we have the ability to differentiate the oceans and show how they are distinctive, not just through the challenges, but through color. Most important as an artist is distinctive relatability for the player, for them to recognize it and say "this is my ocean."

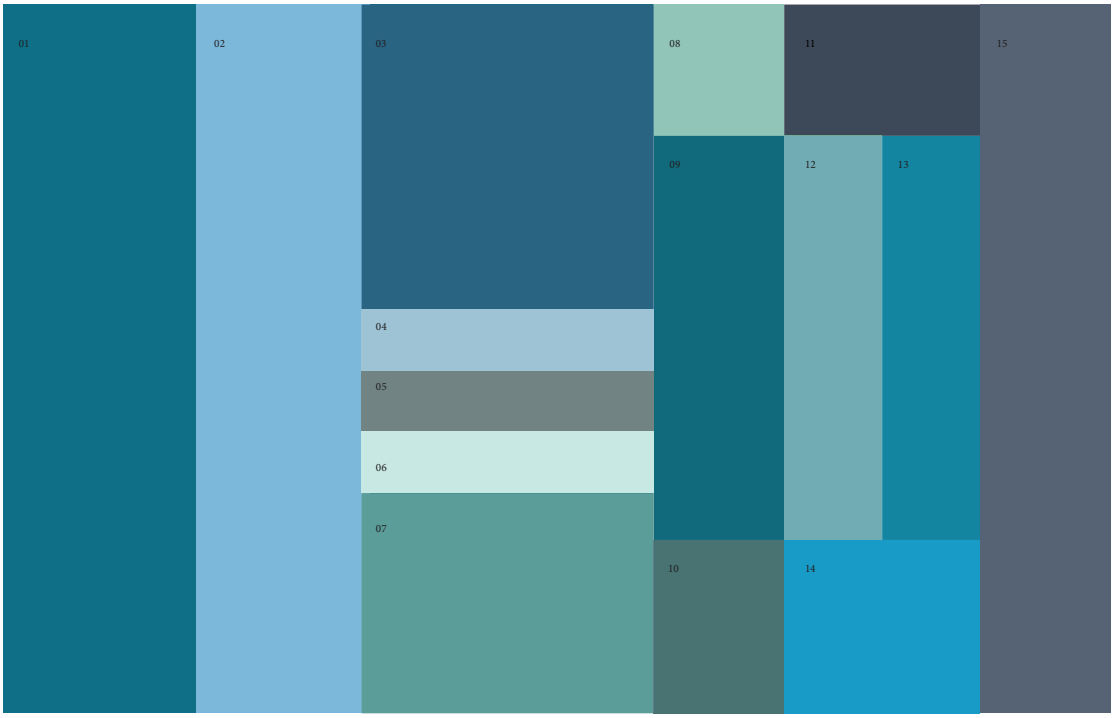
Low-poly style

One of most important elements of design of this game was the usage of low poly models instead of hi poly ones. There are a few attributes that influenced this decision.

Trending style - Many of the more trending visual elements in game and design are minimalistic and geometric styles.

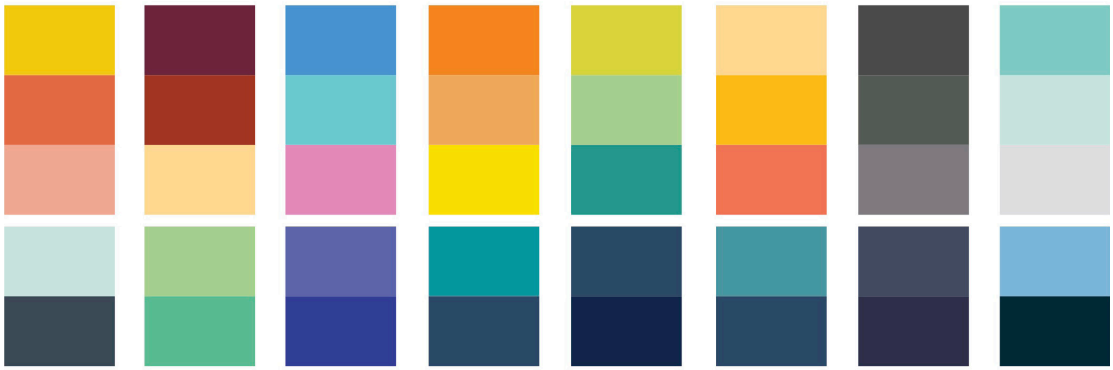
Geometric Aesthetics - It's universally understood that when making complex shapes you start with the key skeleton shapes. With a universal understanding of shapes, we can all have a point of reference for how we distinguish entities.

Low Budget - It is less expensive to have people model low poly rather than hi poly because of the time it takes to render such models.

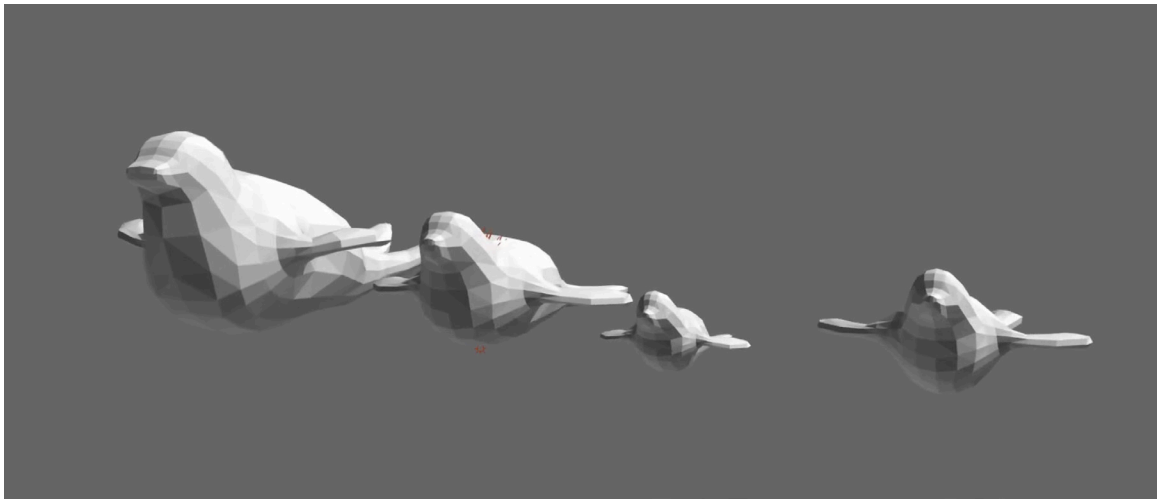


PATONE COLORS
RELATED TO "OCEAN/SEA"

01 TUMULTUOUS SEA
02 BALTIC SEA
03 SEAPORTV
04 AQUAMARINE
05 STORMY SEA
06 SOOTHING SEA
07 SEA BLUE
08 OCEAN WAVE
09 OCEAN DEPTHS
10 NORTH SEA
11 MOONLIT OCEAN
12 MARINE BLUE
13 CARRIBEAN SEA
14 HAWAIIN OCEAN
15 BERING SEA



3D models by Joey Pagano



Visual Sensibility - In reality, marine creatures actually have very poor sense of sight compared to human eyes. So to mimic the experience of a marine creature, it is necessary to dilute the visual details.

Highlighting Audio - The game isn't reliant on the visual elements to proceed; it is reliant on the sound levels and the character's placement within the game. To take us away from our usual dependence on visual cues, we simplified the visual elements and focused on the audio design.

Sound Design

Probably the most complex and intricate part of the game, the sound completely guides and establishes the mood of the game play.

Most of the music inspiration for *Song Searching* is based upon classical music, was commonly used in early films and cartoons as a way to narrate stories. From a young age, we associate certain songs and rhythms with emotions. Sound becomes the universal language with which we can speak to the player. We use sound to establish a pattern. When there is no human activity, the player only hears the natural ocean soundscape but the player will hear the sounds of these unnatural activity as it covers the natural sounds.

Creating this sense of a goal for the player for tranquility and natural silence. The sound is fluctuating and fluid, a storytelling of calm and disruption.

Natural ocean soundscape

The ocean is filled with a variety of sounds from the many different types of species living in the deep sea. With the element of music and clips of different species, there is balance of realistic storytelling and mood creation.

For the humpback whales, their songs aren't meant for echolocation. Although we cannot give solidified answers regarding why they make sound, the fact that whales listen and can communicate across the ocean to one another suggests that this is an important form of connection.

The game focuses on listening as a way of displaying the lack of communicative abilities due to sound pollution in the ocean.

Noise levels

The sounds filling the ocean are varied not only in kinds but also at various different volumes and levels (see fig. on opposite page). At a level as low as 116 dB you can see changes in

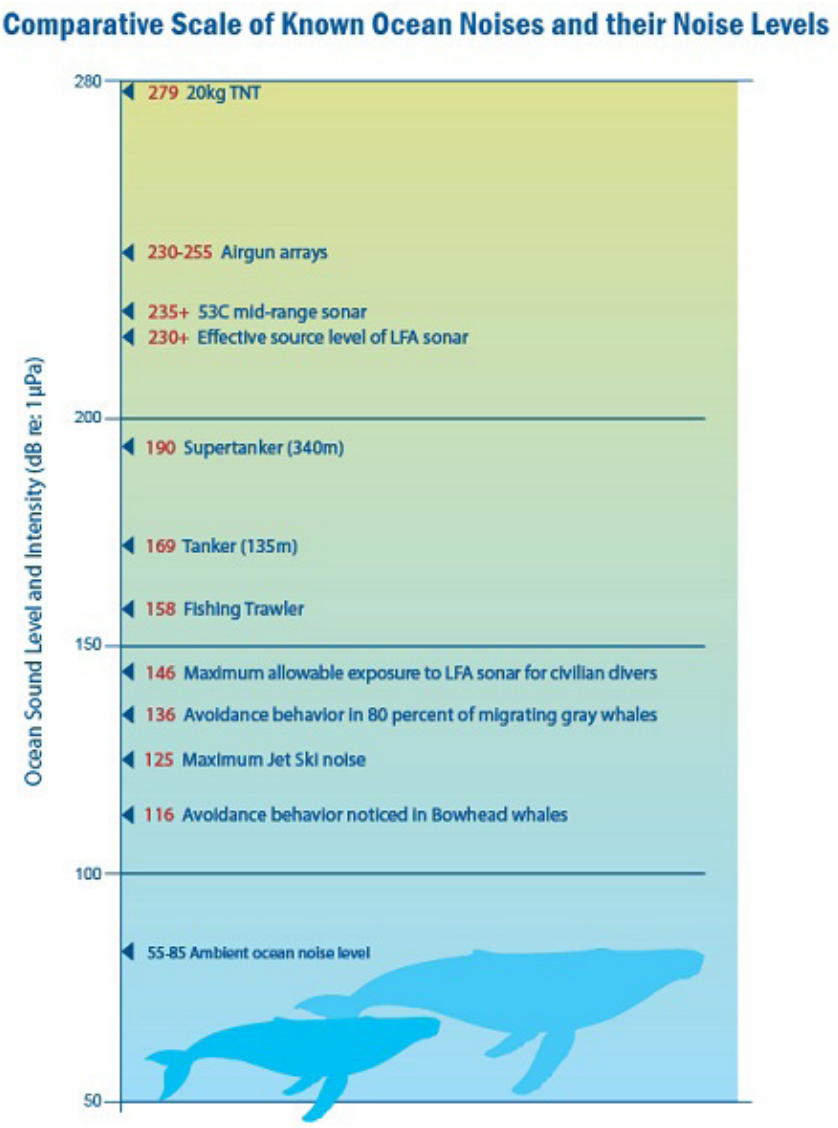
whale behaviors, and yet there are many other sources of noise found at higher levels. Without realization, many of the industrial vehicles we rely on to cross the ocean create a large impact in the soundscape of the marine environment.

Characters

Humpback whales

What originally drew me into researching humpback whales were their songs. Their songs are one of a kind in the marine ecosystem and it draws so much of my curiosity as to why they sing. Knowing that whale songs are being silenced and blocked was shocking and devastating to hear. We know so little and understand practically nothing of these songs and yet we're losing them without even realizing this.

Humpback whales evolved into the ideal species for this game because they're often extremely friendly with many other species. So, by not straying too far from reality, we wanted to create this character that the player forms a bond with and is capable of seeing how the ocean is being affected.



Ocean Noises Chart made by Animal Welfare Institute

Other sea creatures

The marine ecosystem is abundant with many different species living in every nook and cranny found in the ocean. Without our knowledge, the noise we emit into the ocean can sometimes be fatal other species.

Two of the more common marine species that are heavily affected by the soundscape in the ocean are toothed whales and dolphins. Famous for using sound for echolocations, these toothed cetaceans ended up being the inspiration for the very source that end up murdering them. One of the more famous cases was the mass stranding in the Bahamas in the year 2000. Within 36 hours, 17 marine creatures beached themselves — including 14 beaked whales.

Cross-species interactions

Designing the interaction between the main whale and other species includes their many different interactions. Humpbacks interact with their own species, other marine life, and humanity through abstract ways, such as through their difficulties with noise pollution caused by boats.

One of the many eye-catching articles about humpback whales, and potentially why they're a fan-favorite, is that we can see them interacting with many different species, both human and marine. There are many cases of humpback whales helping marine creatures escape from hungry orcas. There are also cases of when they interact with humans both on boats or free floating.

During the fall of 2018, I visited Monterey Bay, California, where I attended my first and very long whale-watching boat ride. I saw signs of humpback whales, but the trick to finding them was based on other creatures. Humpback whales feed on the West coast of USA, and there are seals that eat with humpback whales and birds that feed from the circling of fish. There isn't a main focus of humpback whales solely interacting with humpbacks; they interact with many other species in different ways. This began an extensive and detailed research into the various interactions humpback whales have.

Visual Cues and Gauges

Visual cues are the elements of reality built into the rules and world setup. Instead of explaining these elements and limitations to the player from the beginning to force them to memorize, it is embedded into the player experience and building a habit. The first gauge, hunger, is already unlocked and the player won't understand what it's for until after reaching the first feeding ground.

Hunger / Time

The hunger gauge also doubly symbolizes the time frame of how long until the player reachs Point B, the feeding grounds. To transfer the information of humpback whales being seasonal feeders, we scale the sense of time with the sense of eating. If the player don't eat before the time runs out, they're essentially "out of season."

Air / Breath

The air gauge is a gauge that is an interesting element to the game play because as humans swimming we're used to having to breathe. But many times when we imagine playing a marine creature, we forget that some of them are still mammals that need to breathe. It prevents the player from simply sticking to the bottom of the ocean floor and becomes more of a challenge to keep track of breath. This plays a bigger role once ships start to become more dense; the player

will become more vulnerable to collide with an oncoming ship.

As the game progresses and the character ages, the air gauge will increase by capacity seen in how adult humpbacks surface every 7 - 15 minutes to breathe, but can remain underwater for up to 45 minutes. Calves must surface every 3 - 5 minutes.

Anxiety / Stress

The boats' loud noises creates stress for the humpback whale. A red vignette covers the screen and the player will lose some control moving, making it harder to swim away, surface for air, or avoid collisions with the boats that sail on the surface. The noise itself will not kill the player, but not being able to properlly play will. The player will have to expend extra time to avoid boats and their noise.

When the whale reaches maximum stress, the screen gets a red and dark contrast vignette, which makes it difficult for the player to see.

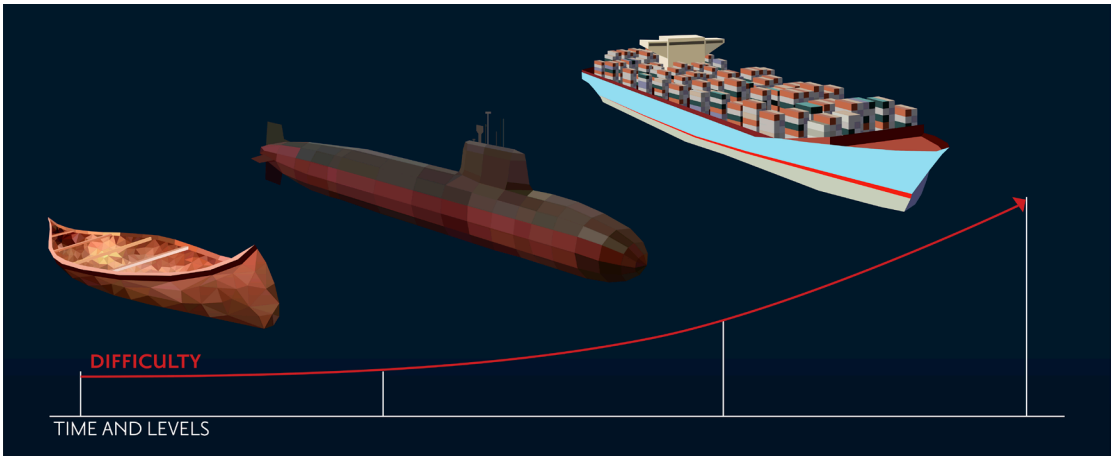
The stress gauge was only going to indicate the damage and stamina from noise pollution, but with the shift of focus to interaction between creatures, there is also a sense of reward from interaction between creatures. So when there are other creatures about, if the player interacts with them, it lowers the stress gauge as well. This encourages the player to interact with other creatures, giving them a positive and natural need for these interactions.

Level Design

Map and Difficulty

The most beneficial part of the map layout is that there are humpback whales in all parts of the ocean, so there are many global routes for us to mimic. The player begins the game by selecting a section of the ocean in which they want to live from the map. This creates an opportunity for the player to become personal to the whale. Because every area of the oceans have different environments and natural elements, there can also be different levels due to the various amounts of pollution in every area. The core of the levels is the x axis of time progressing with noise pollution, which has an exponential growth on the y axis.

One of the lost abilities with ABZÛ is that even though they had reference to real species of fish and their interactions, their map was a fantasy realm. There is a sense of dissociation with these marinescapes and the player's placement in that realm. To some degree, everyone has a connection with the ocean. The ocean is real; it's not another world to escape to.



While the game focuses on noise pollution, Jennifer Telesca brings to attention the many pollutants in the ocean in general. In acknowledging many other pollutants in the ocean, they become embedded into the level design resulting in a variety of obstacles and difficulties.

Even in reality, there are different parts of the ocean that have varying levels of marine traffic than the average. The purpose of the ability to choose one is setting is to realize how different these areas are because of trading routes and other pollutants. If the player lives in Sydney, Australia and chose the waters around Australia and realized that completing the game was easier than off the coast of China. Allowing the player to understand the circumstances of the waters they live near.

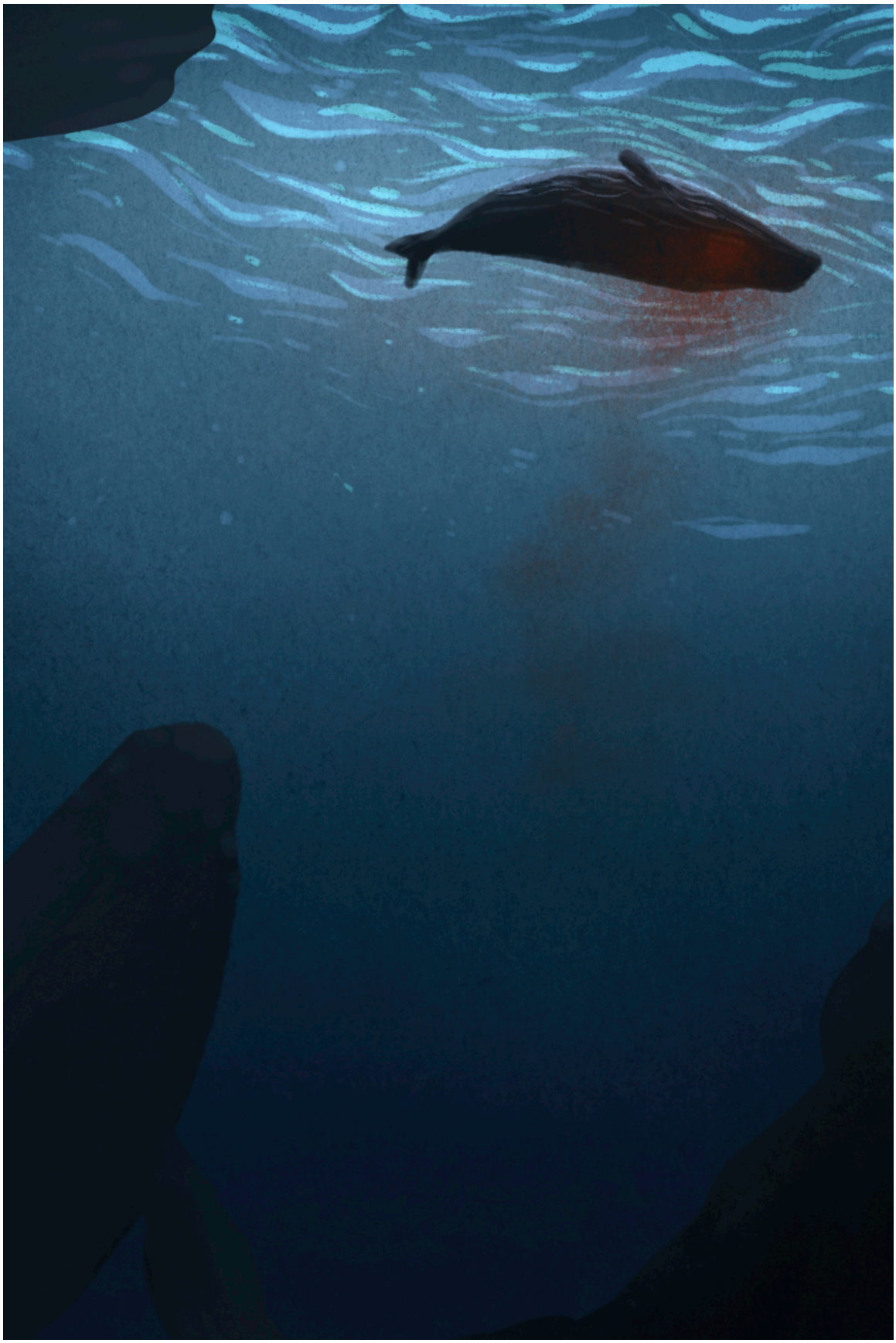
Interaction Over Time

With the focus of interaction made between the main whale and the surrounding lives and sounds, there are specific narrative scenes that demonstrates how noise pollution can affect these interactions.

One of the scenes I want to ensure is included in the narrative is a scene of the Cuvier's Beaked Whale bleeding from its ear (see fig. opposite page). This scene is referencing to the 17 cetacean mass stranding in the Bahamas in the year 2000. Some of the specimens that were able to be salvaged and examined displayed bleeding around the ears.

This vivid scene of looking up at the light refracting across the surface and glistening down to the player, but there is a floating body – swaying as you see blots of red seek out.

Even if baleen whales aren't being evidently affected as badly as toothed whales, it doesn't mean that something isn't happening.



Cuvier's Beaked Whale bleeding from its ear as the main character watches from below.

Game Design Matrix

Code	What we want the player to learn, feel, discover, and/or realize	What the player experiences	Changes Over Game Trajectory	Difficulty?	Location where this happens	In playable game?	Current iteration
"LOOKING BACK"	Humpback whales are creatures that have intelligence and are sentient beings with souls.	1.) When the whale experiences a diver and have a calm and peaceful interaction. 2.) By playing the game the player will see that certain actions and choices couldn't be done without the "animals" being more than just "animals"			Specific Scene		
BOAT	Boats represent a serious source of both marine noise and collision risk.	These undistinguishable beings are damaging the experience and interrupting the lifestyle of the player.	There will be an drastic increase of shipping boats and more variety of marine sources [See NPOLLSOURCE]	Easy - Hard	All locations	TRUE	There are boats sa across the surface water as you swim
BOATENERGY	Whales may have to expend extra energy avoiding boats and the noise they produce, which can affect their ability to survive their long migrations.	Passing boats will have varying sized radius' of damage. This keeps the player on their toes	There will be a variety of boat sizes and specialties that have their own radius of damage.	Easy - Hard	All locations		
BREATH	Humpback whales must periodically return to the surface to breathe	An oxygen meter shows the level of oxygen for the whale. This supply can be replenished by surfacing. Failure to surface in time results in drowning.	In earlier versions of the game, the juvenile player is prompted by the mother character to surface and breathe. As player gets to be older humpback, they have a larger lung capacity, which allows them to stay submerged for longer.	Easy	All locations	TRUE	Crude blue circular oxygen meter. Play can replenish suppl surfacing.
CLIMATECHANGE	The player will see the drastic changes that occur in the ocean when climate change begins. That the rise of ocean temperature is a big factor to its marine lives.	1. The water will "warm up" [refer to MIGRATEIDEAL] 2. Nearby corals will bleach and lose colors					
COOPFEED	Cooperative feeding allows humpbacks to more effectively hunt small schooling fish than could be accomplished alone.	The player will witness bubble feeding as they demonstrate the actions needed to bubble feed.		Hard	Feeding grounds		
COOPFEEDREJECT	The benefits of cooperative feeding are in part maintained by social sanctions: a whale who fails to synchronize with others -- or who cheats -- will be rejected as a future social partner.	The player has 3 chances to perform a successful bubble feeding round. When the player misses a step or performs an action wrong the bubble feeding will disperse and the player must try again.		Normal	Feeding grounds		
COOPFEEDSKILL	Cooperative feeding is only effective if all members of the feeding group work together in unison. Any lack of behavioral synchrony -- or “cheating” to try to grab the prey first -- leads to loss of prey.	Overtime as the player learns to cooperate well in bubble feeding among adults, there will be more gained efficiency in eating as you accumulate more successes in bubble feeding		Hard	Feeding grounds		
EMPATHY	Player feels empathy for plight of whales	1. Whale can die due to interactions with human creations 2. Whale has no explanation of what's happening or why just like the player		Easy		TRUE	
MALESONG	Song is used by males to assess each other in ways that are very similar to songbirds	Males can sing songs to communicate with other males (either for cooperative or competitive reasons).			Breeding Grounds		
MALESONGCOMP	Rather than engaging in direct conflict that would be potentially injurious or even deadly, whales use song to assess their competitors and establish which whales can hold particular territories	Player has to decide which males to challenge based on the complexity of their song; taking on a male whose song is more complex	The keyboard hot keys will be assigned to different units/phrases for composing humpback songs. Over time there will be more options to make and customizing to occur. This will be essentially the player's only palette (1-0 Keys)		Breeding Grounds		
MALESONGPLAG	Males can "steal" or "borrow" phrases from other whales	Player can increase their song repertoire by emulating the sounds of the other whales they encounter. Having a larger repertoire increases your chances of attracting a mate or repeling a competitive male.			Breeding Grounds		
MATINGCOMP	Males may sing to attract females, who try to exercise mate choice by selecting the male with the most appealing song	As a male adult, you'll notice that when you are trying to attract a mate there will be other male humpback males singing their songs as well. The ones with more complecated songs and volume (heard) will get the female closest to them even if you as a player are next to one			Breeding Grounds		

This was the Google Spreadsheet used by Chris and I for laying out what elements of truth and theory needed to be included in the game — and where. There are a few of the game elements that weren't finalized or haven't gone around to. This wasn't a finalized diagram of the game but an effective workspace to organize notes and thoughts.

	L1?	L2?	L3?	L4?	L5?	L6?	L7?	L8?	Comments?	Sources of evidence:
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		The distribution of brain sizes among whales seems to follow a similar pattern to that of primates, suggesting that cetacean brains evolved to solve similar ecological and social problems : Fox et al. 2017
ling of the below	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Shipping routes as they affect large whales : Pirotta et al. 2019 Boat strikes are a cause of stranding : Groch et al. 2018 Humpbacks alter their foraging behavior in response to boat traffic, lowering their foraging efficiency : Blair et al. 2016
		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Shipping routes as they affect large whales : Pirotta et al. 2019 Humpbacks alter their foraging behavior in response to boat traffic, lowering their foraging efficiency : Blair et al. 2016
er y by	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Whale dive times while singing vary from 5-20 minutes in duration, and may indicate differences in physical condition between individuals : Chu 1988
			TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Ocean temperatures are expected to increase globally, although some areas of the polare oceans may cool due to disruptions of tropical ocean current flows : Intergovernmental Panel on Climate Change 2013
				TRUE	TRUE	TRUE	TRUE	TRUE		Johnson et. al. 1984 Bubble feeding is best explained as a cooperative behavior : Wiley et al. 2011 Whales use distinctive calls in their their feeding grounds : Fournet et al. 2018
				TRUE	TRUE	TRUE	TRUE	TRUE	Does the player use the keyboard to produce songs?	Not clear if this has been specifically studied in whales, but "partner sanctioning" is common in other cooperative species.
				TRUE	TRUE	TRUE	TRUE	TRUE	How would the player actually produce song?	Johnson et. al. 1984 Bubble feeding requires precise coordinated body movement : Wiley et al. 2011 Whales use distinctive calls in their their feeding grounds : Fournet et al. 2018
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		People with more regular contact with animals have higher empathy for other species : Signal and Taylor 2007
					TRUE	TRUE	TRUE	TRUE		Males sing to mediate their competive interactions : Cholewiak et al. 2018 There is evidence that humpback whale song could contain components aimed at attracting females while simultaneously signalling to other males : Murray et al. 2018 Males may use song to organize cooperatively, attracting more females : Darling et al. 2006
					TRUE	TRUE	TRUE	TRUE		Males sing to mediate their competive interactions : Cholewiak et al. 2018 There is evidence that humpback whale song could contain components aimed at attracting females while simultaneously signalling to other males : Murray et al. 2018 Males may use song to organize cooperatively, attracting more females : Darling et al. 2006
					TRUE	TRUE	TRUE	TRUE		Songs are copied with high fidelity : Allen 2018 Cultural transmission of songs has been followed through several populations of humpbacks : Garland et al. 2013
					TRUE	TRUE	TRUE	TRUE		Males may form "floating leks" in which groups of males sing to attract female attention : Clapham 1996 There is evidence that humpback whale song could contain components aimed at attracting females while simultaneously signalling to other males : Murray et al. 2018 Males do aggregate in ways that suggest competition for females, but these aggregations may also serve as ways for males to sort out intra-sexual dominance hierarchies : Clapham et al. 1992

MATINGHARASS	Females may be threatened by males who are seeking to mate				Breeding Grounds		
MATINGSIGNAL	Females can pec-slap to attract a male and let him know that she is sexually receptive	As an adult female you notice other adult females pec-slapping and going off with males (indicating eventual mating) and you will learn the skill to pec-slap to attract a male			Breeding Grounds		
MIGRATE	Humpbacks migrate in alternation between summer feeding grounds in the polar regions and winter breeding grounds in the tropical regions	The player will start to understand and realize that they're swimming in the same path for most of the game unless something causes them to leave the area and makes them go another migratory route			Migratory Routes	TRUE	
MIGRATEIDEAL	Migration allows humpbacks to alternate between ideal feeding grounds near the poles and ideal breeding grounds near the equator	The player will notice the change in color of the blue of the ocean ie. cyan to teal and vise versa. And having to migrate in time to restore food stores	The player will notice that the breeding ground water color will be lasting longer and the feeding ground water will be losing its color. Hinting towards climate change		Migratory Routes		
MIGRATEPODS	Humpbacks usually travel in pods	During juvenile and adult migratory routes the player will experience traveling with other whales along the way. This can be fun and exciting and team bonding but can display the struggles of keeping the team together under the pressure of pollution in the ocean			Migratory Routes		
MIGRATESOUND	Humpback whales use sound communication to maintain contact with members of their pods	[Am not sure. Need to do more research on humpback calls outside of songs]			Migratory Routes		
NPOLL	Because humpback whales use sound for both communication and to assess their environment, sound pollution can make it harder for them to survive and	1. Noise pollution increases stress and the higher the stress, the lower the player's agility (response of game controller, maximum speed of			All locations	TRUE	
NPOLLDAMAGE	In order to take advantage of sound as a source of information, whales have evolved very sensitive hearing. This crucial sense can be damaged by very intense marine noise.	When the humpback whale reaches max stress, the screen gets a red and dark contrast vignette lense which causes the player a more difficult time to see.					
NPOLLOTHERS	Species other than humpback can suffer different and sometimes worse consequences from noise pollution. --- Extreme marine noise can lead to stranding, which occurs when whales travel too close to shallow waters to avoid the source of noise and/or because whales can't use marine sounds to gauge their distance to the shoreline.	Player sees other marine species suffering (possible bleeding dolphin ears, stranded whales). This increases stress on the player, either by direct stress increases or the lack of opportunities to relieve stress.			All locations		
NPOLLSOCIAL	Because humpbacks are very social creatures and their singing serves a variety of social functions, sound pollution can disrupt their normal social interactions.	Noise pollution makes it harder for the player to hear signals of other whales. This impedes the ability of the player to respond to these signals.			All locations		
NPOLLSOURCE	Some common sources of noise pollution are boats in shipping lanes, seismic surveys, military sonar, drilling	When the player comes near a source of noise pollution, they hear it in their audio and they see the red stress bar increase.	Shipping in the earliest noise source encountered; later the player encounters military sonar and seismic surveys			TRUE	
OVERFISHINGENTANGLE	Many whales don't die from other pollutants as fast or as deadly as entanglements from floating fishing nets.	While on route or at feeding grounds, there will be floating nets that are either too hard to see or suddenly come into your vision unnoticed. This will create the whale to slow down immensily			Feeding Grounds + Migratory Routes		
OVERFISHING	Human fishing efforts can reduce the available food for humpbacks, particularly [?????].	In areas where humans are actively fishing, it takes more time and work to actually get enough food.			Feeding Grounds		
PPOLL	The ocean is a place where a variety of pollutants aggregate, including macroplastics, microplastics, and a variety of toxic pollutants	If there is plastic pollution in the feeding grounds, accumulation of nutrition is less efficient.			All locations		
PPOLLHARM	Whales can be harmed by some of these pollutants; others are simply obstacles to be avoided.	The player has to avoid plastic debris and if they fail to avoid it they can become entangled in fishing gear. Player can drown in extreme cases, but at the very least loses time and energy and may have to perform special maneuver to become freed. Eating plastic could increase the stress level and lower swimming performance.			All locations		
PRNTCARE	During their first year of life, humpback calves are very dependent on their mother for nutrition, protection, guidance, and social learning.	The player will notice that they cannot advance from level 1 unless they stay close with the mother at all points			Breeding Grounds	TRUE	
PRNTCARECOMM	Mothers "whisper" and pec-slap to communicate with their calf	1. As a baby you'll experience your mother whale whispering to you to either communicate something or to simply keep tabs on where you are 2. As a mother whale you'll experiecne the necessity to whisper back and forth with your calf so they don't die from any situations					

					TRUE	TRUE	TRUE	TRUE		
					TRUE	TRUE	TRUE	TRUE		Females pec-slap to elicit competition from males and to indicate that they are sexually receptive : Deakos 2002
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Migration patterns between the tropical South Pacific and Antarctica : Riekkola et al. 2018 Females and males may have preferential migration routes : Franklin et al. 2018 Humpback whales follow migratory routes with high fidelity : Horton et al. 2017 Migration timing depends on the sex, age, and reproductive status of humpbacks : Craig et al. 2003 Southern and Northern populations of humpbacks can overlap in their tropical mating grounds : Rasmussen et al. 2007
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Migration from the poles to the tropical areas allows for feeding where food is more abundant but mating in warmer waters : Johnson et. al. 1984 Calving in warmer waters may reduce the metabolic demands on nursing whale mothers : Mann 2009
	TRUE		TRUE			TRUE	TRUE			Following pods migrating between the tropical South Pacific and Antarctica : Riekkola et al. 2018
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	We are not sure how this would be simulated in the game because the player can always turn up the volume to some degree; we also don't have evidence that this happens in humpbacks.	
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Noise pollution may cause humpback whales to deviate from their normal migratory pathways, which may slow their effective migration rates : Dunlop et al. 2017 Marine noise pollution has been increasing over time : McDonald et al. 2006 Over time, blue whales have lowered the tonal frequency of their songs, perhaps to
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		
		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Dolphins and other whale species that strand show signs of hearing loss : Mann et al. 2010
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Humpback whales did not appear to change social behavior in relation to airgun arrays : Dunlop et al. 2017 Humpback whales alter their method of communication when faced with increased levels of ambient noise : Dunlop et al. 2010
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Airgun arrays as a source of noise pollution : Dunlop et al. 2017
				TRUE	TRUE	TRUE	TRUE	TRUE		Other whales have been observed to be injured by encounters with marine plastic : Law 2017 Exposure to noise pollution may make humpbacks more susceptible to entanglement in fishing gear : Todd et al. 1996
		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		When fisheries have been overfished, humpback whale populations have declined, but these populations have recovered when fisheries recovered : Read and Brownstein 2003
			TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Humpbacks move through areas with high density of microplastics : Germanov et al. 2018 Other whales have been observed to be injured by encounters with marine plastic : Law 2017
			TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Other whales have been observed to be injured by encounters with marine plastic : Law 2017 High levels of phthlates have been detected in other plankton-feeding baleen whale species : Fossi et al. 2012 Humpback whales are commonly entrapped in fishing gear : Todd et al. 1996
	TRUE				TRUE	TRUE	TRUE	TRUE		Humpback calves stay very close to their mothers, nurse for extended periods of time : Mann 2009
	TRUE				TRUE	TRUE	TRUE	TRUE		Low-amplitude "whispering" appears to be important for mother humpback communication with their calves : Videson 2017

PRNTCAREMALES	Aggressive males, who try to mate with the mother, can be a threat to a mother and her calf	As a mother whale, while you are traveling with your baby or juvenile there will be adult males trying to seduce or get in between you and your offspring			Female Mother - All locations		
PRNTCAREMIGRATE	Humpbacks learn their migratory route from their mother.	The player will notice that they cannot advance from level 1 unless they stay close with the mother at all points			Level 1 - All locations	**TRUE**	
PRNTCARENPOLL	Sound pollution can be a challenge to humpback mothers, who use sound signals to maintain contact with their calves.	The player will notice that they cannot advance from level 1 unless they stay close with the mother at all points			Female Mother - All locations	**TRUE**	
PRNTCAREPRED	Predation from orcas is a threat to calves.	As a mother whale when you're traveling with your calf and when either you seperate for too long or your calf sings too loud, orcas will swim closer and potentially prey upon your calf.			Female Mother - All locations		
PRNTTEACH	Humpback mothers teach their offspring important survival skills in their first few years	1. Mother character will push juvenile player up to surface in time to breathe. 2. Mother moves towards feeding grounds to show juvenile how/where to feed				**TRUE**	
REPRODSONGFEMALE	Females prefer males who sing stronger/longer/more complex songs	Female whales who choose the best male songs have offspring that are easier to keep alive.			Breeding Grounds		
REPRODSONGMALE	Males who sing more complex songs are more likely to attract a mate	As a male adult, you'll notice that when you are trying to attract a mate there will be other male humpback males singing their songs as well. The ones with more complecated songs and volume (heard) will get the female closest to them even if you as a player are next to one			Breeding Grounds		
SOLOFEEDING	Humpbacks eat krill, small prey fish (kinds?)	Mother moves towards feeding grounds to show juvenile how/where to feed			Feeding grounds	**TRUE**	
SOLOFEEDINGSMELL	Humpbacks may use their sense of smell to locate krill				Feeding Grounds		
PRNTCARENURSE	In order to survive their first migration with their mother, calves need to nurse regularly in order to acquire sufficient energy for growth and locomotion.	?? Should the infant have to nurse in order to maintain its energy reserves in early stages of the game?					
SOLOFEEDINGSONG	Humpbacks may use their calls to manipulate prey	?? Could song production be used to better succeed at feeding ??					
POPRECOVERY	Certain populations of humpbacks are recovering from previous exploitation; bans on hunting humpbacks have allowed for this population recovery.						

					TRUE	TRUE	TRUE	TRUE		
	TRUE				TRUE	TRUE	TRUE	TRUE		Females with calves migrate at different times than females without calves - Craig et al. 2003 Humpback mothers often migrate with males, perhaps to help fend off Orca attacks on calves : Mann 2009
	TRUE				TRUE	TRUE	TRUE	TRUE		Low-amplitude "whispering" appears to be important for mother humpback communication with their calves, suggesting that their communication could be interrupted by noise pollution : Videson 2017
					TRUE	TRUE	TRUE	TRUE		Videson 2017, Jefferson et al. 1991
	TRUE				TRUE	TRUE	TRUE	TRUE		Humpback juveniles can learn new feeding techniques from individuals that are not their mothers : Mann 2009
					TRUE	TRUE	TRUE	TRUE		
					TRUE	TRUE	TRUE	TRUE		
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE		Humpback whales switch between krill in colder ocean conditions and schooling fish in warmer ocean conditions : Fleming et al. 2016
										Calves maintain high suckling rates : Videson et al. 2017
										Humpback whales have a particular feeding call that may be used to manipulate prey : Fournet 2018
										There are increased rates of pregnancy around of the Western Antarctic Peninsula : Pallin et al. 2018

Story Line

Levels are incremental parts of the main character. The narrative focuses on the effects of sound pollution to the marine ecosystem, and passing each level is an achievement of surviving another round despite increasing distractions.

Beginnings

We start with Level 1 as a calf, or baby whale, which is called Beginnings. Here, the mother whale will teach you how and when to surface for air, how to play and socialize with other creatures, where the route leads, and how to feed. Without the mother, a calf would die, and equivalently you cannot pass Level 1 unless you are with her at all points. After feeding and finally reaching the breeding grounds once again, you'll meet your first boat and be separated from your mother.

Separation

This brings you to Level 2, the start of the section in the narrative called Separation, which also includes Level 3. Here, as you grow older, you'll have to successfully complete all the tasks the mother in Level 1 has taught you as more boats and pollution are involved exponentially with time.

Different gauges will appear on the screen to let you know when it is time to surface for air and when to feed.

Changes in the shade of blue of the ocean will indicate whether you are near the winter, tropical breeding grounds, or the summer, polar feeding grounds.

Occasionally, humpbacks travel in pods. In these levels, the challenge will be to keep the team together under the pressure of pollution.

Survival

The next chapter is Survival, which encompasses Levels 4-7. You are no longer an adolescent, and as such, the full hardships and responsibilities of a whale's life is introduced.

These levels have different objectives depending on whether the player chose to be male or female.

The males will need to sing to attract females, who exercise mate choice by selecting the male with the most appealing song. Males can copy phrases from other whales, and the player can increase their song repertoire by emulating the sounds of other whales they encounter, which increases your chances of attracting a mate or repelling a competitive male. The whale with the most complicated songs and louder volume will get the female closest to them.

As an adult female, you'll notice other adult females pec-slapping and going off with males, indicating eventual mating. You'll have to learn to pec-slap in order to attract a male. When you return to the breeding grounds at the end of the level, you'll move to Level 5, in which you'll have your first baby.

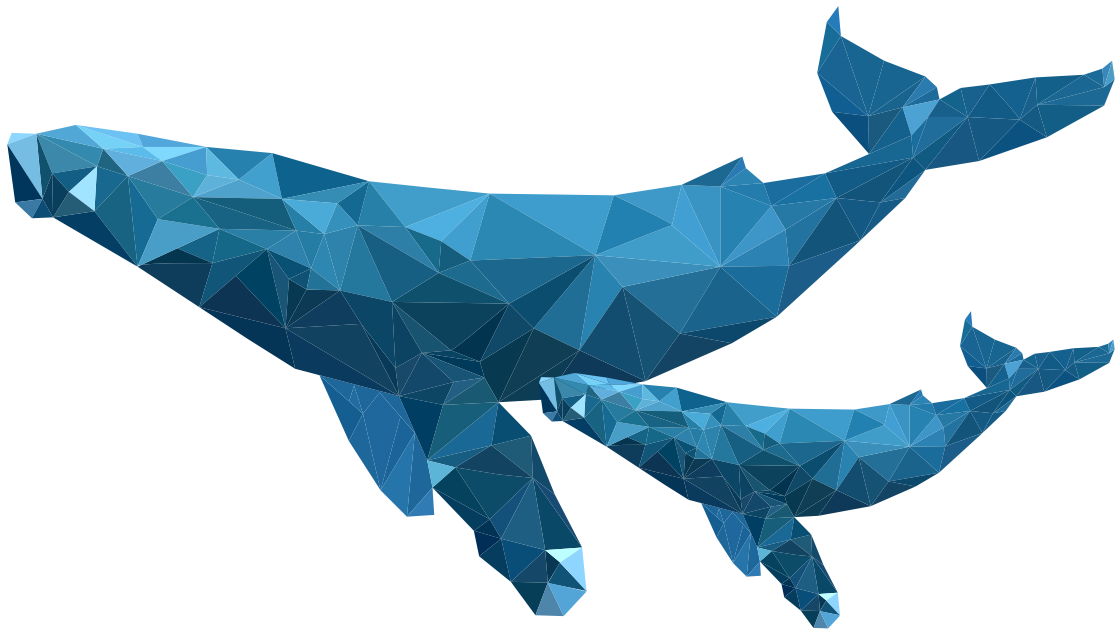
With your baby, you'll have to do many of the things your mother did for you, except new challenges are introduced. Communicating with your baby includes pec-slapping, which will attract aggressive males who try to mate with you. This can be a threat to your calf by separating the two of you. If you are separated from your calf for too long, or if your calf sings too loudly, orcas will swim closer and potentially prey upon your baby. After completing the route successfully with your calf, you'll have to mate and reproduce to move onto the next level. You will be in charge of two or more babies going forward.

Because Humpbacks use sounds for both communication and assessment of their environment, sound pollution makes it harder to survive and reproduce.

Deaf

The last chapter is Deaf, containing Level 8. You'll have to continue overcoming all of your established challenges, but now while losing your hearing through the level.

This element is not a proven theory on the affects of noise pollution



Branding

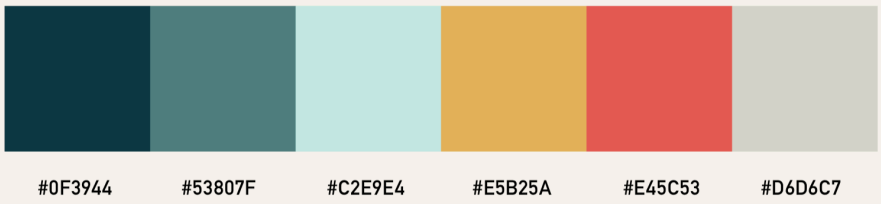
Creating the brand of the game was the most exciting part to partake in. It's something I am extremely well versed in and have a professional background on creating. That being said, to tackle a larger project like *Song Searching*, I recruited, Alycia Hinrichsen and Jooyoung Park, artists with exceptional work.

The palette scheme includes a diagram demonstrating the variation of blues found in the branding. Outside of the variation of teals descending as the level progress, there are variants in greys inspired from the 3d models. Alycia Hinrichsen created a new section in the color scheme which was the sound wave colors. With a coral red to represent the disruptive noise pollutant, a warm yellow balances out the power of the aggressive red.

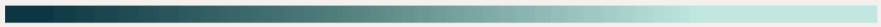
With the new color branding we had to establish in the direction of either usage of these colors and what direction the visual brand need to go. Originally the only graphics that were created for the game were 3d models and an older design logo of a whale and sound coming from its spout. With Alycia's visual research design, she explored and created a design direction of topographic maps, paper cuts, and sound wave design approach.

Design Concept by Alycia Hinrichsen

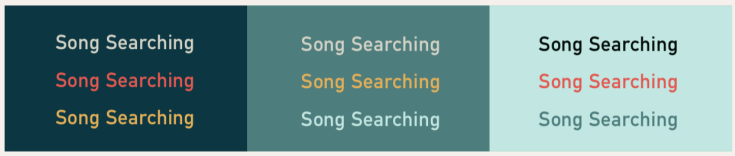
Palette Scheme by
Alycia Hinrichsen



General Color "Percentage" Guidelines



Main Colors Gradation

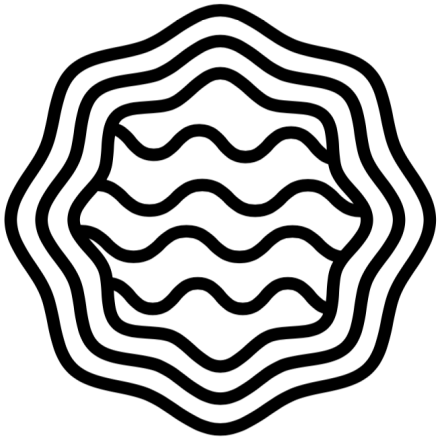


Color Usage Guidelines

Brand Graphics by
Jooyoung Park

The original logo was based on the concept of balance and sound. The lines repeated around the whale and filling in the remaining space to create the final circle. Instigating that sound is also half the necessity.

Logo sketch by Jooyoung Park



song searching

By this iteration of the logo, the design is completely removing the focus on the humpback whale and creating a focus on the space -- the oceanscape. Creating an almost stamp or seal based design.

Logo sketch by
Jooyoung Park

Reducing from the past logo, Jooyoung made many different sketches on how to incorporate this design based logo into a more simplified and contextual approach.

SONG SEARCHING

The final logo design completely narrowing the icon to be focusing on the term “wave” and create that blur between ocean waves and sound waves. By creating these shapes to have a three dimensional shape with depth, we draw it to the game design to its three dimensional models.

Data Collection

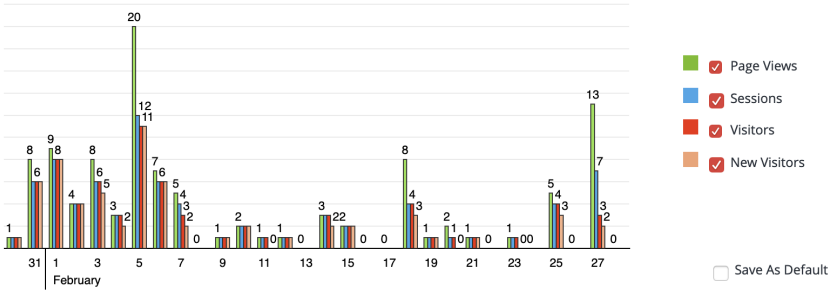
One of the many great opportunities is collecting data on user experience and numbers on people who had an interest. Using various sites gives us more information and helps keep track of the amount of visits, locations, software, and hardware. We can use this data to get an understanding of what our players are working with and how to adjust our methods while in an early phase.

Some of my favorite data points would be the play testing submissions by people in the field. I have a lot of hope and excitement to push through the boundary between science and art.

We used Google Forms as our play testing data collecting program. Google sub-programs are commonly well known for their easy user experience and their sleek design. With the creation of two different forms before and after playing the game, we were able to see what about the game players didn't enjoy or didn't understand because they don't have any background in this topic or the game didn't portray it. We were able to get a variety of people to play test the game during its earlier prototypes. There were major changes that resulted from the play testing like changing the tutorial ambiguous unexplained trial to instead have visual explanations on the controls and goals due to people getting confused to controls or any of the gauges.

We then used **statcounter.com** to keep tabs on the site itself (see fig. on pg 33-34). This site records many of the different types of information needed. Some of the information that helps with future iterations is the type of hardware and software people were using. For example: keeping in mind that majority of the people who play tested the game show that they used Apple computers rather than windows. This plays into making sure that if the game isn't functional on an ios device, that will be a big hinder for user experience. This also plays into browsers and how data shows that people used Chrome.

One of the potential choices after data collection is that people were visiting the website from their mobile devices as well, opening up the idea of how this game would play out from hand-held devices.



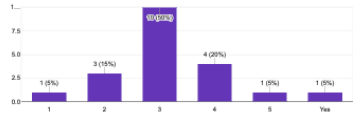
21 responses

Accepting responses

SUMMARY INDIVIDUAL

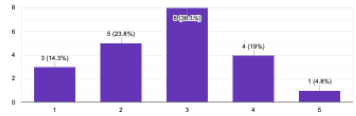
How much did you enjoy the game?

20 responses



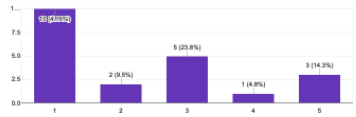
How fun is the game on a scale of 1-5?

21 responses



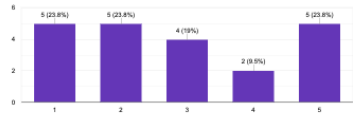
How difficult were the controls on a scale of 1- 5?

21 responses



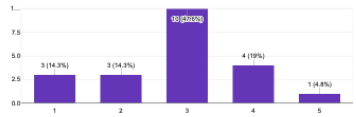
How difficult was it to understand the health-bar/air gauge systems on a scale of 1-5?

21 responses



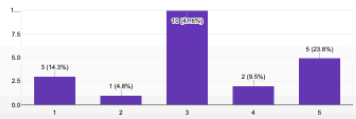
How difficult was navigating/swimming through the ocean on a scale of 1-5?

21 responses



How challenging was dodging sound pollution on scale of 1-5?

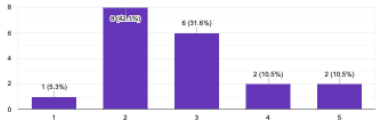
21 responses



Education

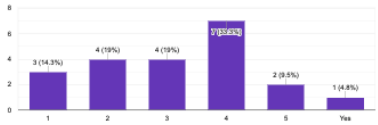
How would you rate yourself on knowledge of noise pollution on a scale of 1-5?

19 responses



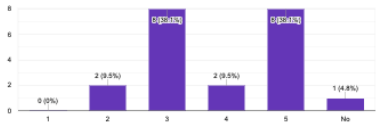
Did you learn more about noise pollution?

21 responses



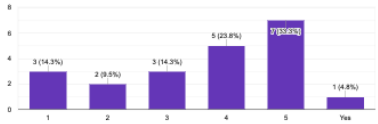
Was the game less fun because it is educational?

21 responses



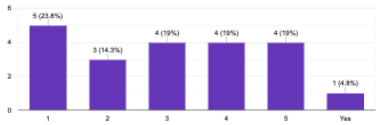
Are you more interested in learning more about marine life?

21 responses



Are you more likely to investigate noise pollution in the ocean on your own?

21 responses



What do you think happens to the whale in level 2?

18 responses

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Final Statements

My name is Ami I am an American of Chinese descent. I relate to both cultures differently and this helps me define who I am. It's beautiful and complex to grow up in between worlds with varied cultural influences. My only setback is the difficulty in linguistic communication. Through the support and love of my father, I've learned that bonding and understanding doesn't require verbal skills. Humpback whales can perhaps understand this better than we realize, and I want to communicate this artistic and fluid language that they've developed within their own regions, or cultures, over generations, and the ways in which we are negatively affecting their world.

During the Fall 2017 semester, I began to develop this project while enrolled in Environment Ecology and Anthropocene at Pratt Institute, taught by Chris X. J. Jensen. Entering the class was exciting because I was able to return to learning about the relationships between the various elements of nature. There were several topics discussed in class, including ecological communities, biodiversity conservation, climate change, and pollutants, all of which influenced this work.

As students, once we understood more accurate terminology and concepts, we were then required to propose our term project. During those first few weeks, I had watched an animated video by the Ted Education YouTube Channel, "Why do Whales Sing?" taught by Stephanie Sardelis.

One of the most successful explanations of noise pollution is the film *Sonic Sea*, which references how noise pollution occurs, why it's an issue, whom it's affecting, and what can we do about it now. By making the information digestible and easy to follow, it was incredibly influential.

My completed term project in my Environment Ecology and Anthropocene class resulted in a long, printed scroll (see opposite page), which included a breakdown of the game plan and design. This was a very successful and exciting assignment to create — essentially, it was the original and core development of the game *Song Searching*.

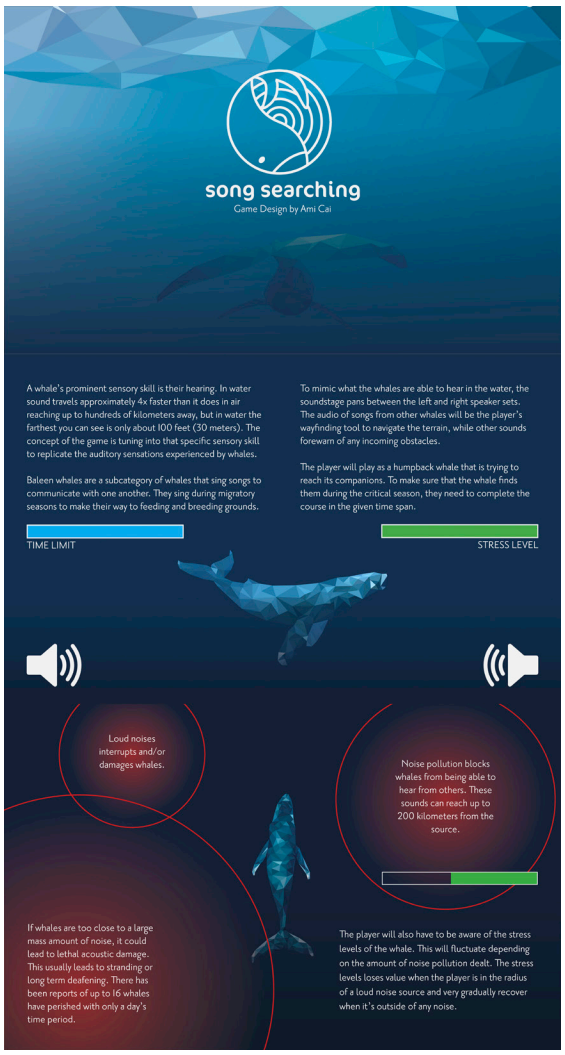
When I first finished this assignment, I was advised regarding potential directions to take this project, and one was to develop it further into a game. Creating this game myself seemed a Herculean task, but thanks to Basem Aly recommending me to apply for Pratt's STEAMplant program, I received a grant to do develop this project and further my research and design.

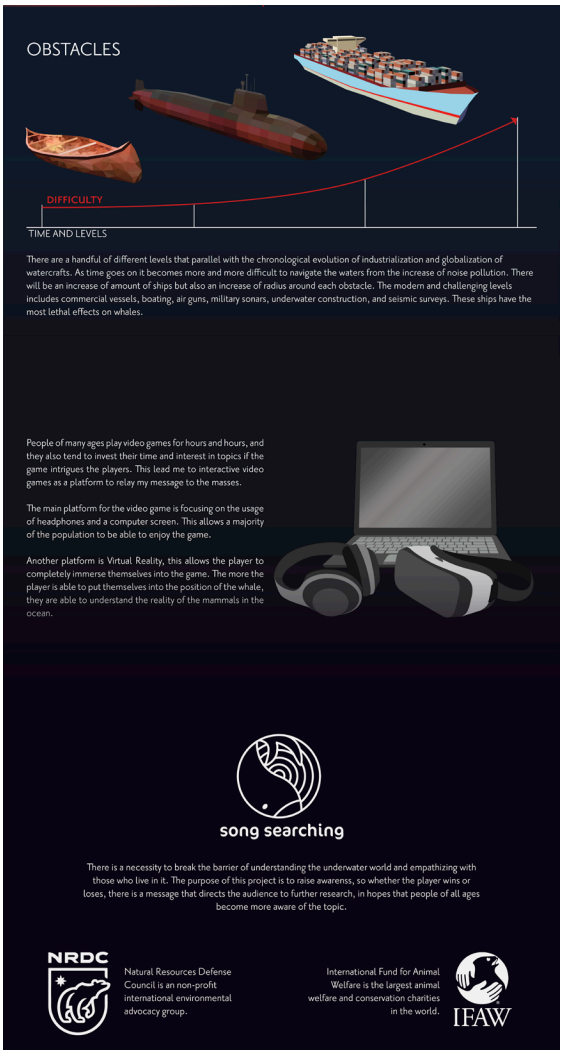
The game is still in its early phases but it has come further than I ever imagined it becoming. The development of *Song Searching* has grown exponentially; I was able to put together a team of programmers, audio designers, and consultants in order to push this initial interest into the realm of a realized product.

The most dedicated and motivated team member was the lead programmer and developer, Sarah Meadows. A phenomenal team member and constantly growing throughout the project. Sarah has been able to both lead and delegate tasks within deadlines and work in multiple different aspects of the video game.

" You came up to me and said I want to make awareness that whales are horrifically dying from noise pollution; something that can be easily fixed. All that's missing is the awareness "

- Sarah Meadows


song searching
Game Design by Ami Cai
A whale's prominent sensory skill is their hearing. In water sound travels approximately 4x faster than it does in air reaching up to hundreds of kilometers away, but in water the farthest you can see is only about 100 feet (30 meters). The concept of the game is tuning into that specific sensory skill to replicate the auditory sensations experienced by whales.
Baleen whales are a subcategory of whales that sing songs to communicate with one another. They sing during migratory seasons to make their way to feeding and breeding grounds.
To mimic what the whales are able to hear in the water, the soundstage pans between the left and right speaker sets. The audio of songs from other whales will be the player's wayfinding tool to navigate the terrain, while other sounds forewarn of any incoming obstacles.
The player will play as a humpback whale that is trying to reach its companions. To make sure that the whale finds them during the critical season, they need to complete the course in the given time span.
TIME LIMIT
STRESS LEVEL
Loud noises interrupts and/or damages whales.
Noise pollution blocks whales from being able to hear from others. These sounds can reach up to 200 kilometers from the source.
If whales are too close to a large mass amount of noise, it could lead to lethal acoustic damage. This usually leads to stranding or long term deafening. There has been reports of up to 16 whales have perished with only a day's time period.
The player will also have to be aware of the stress levels of the whale. This will fluctuate depending on the amount of noise pollution dealt. The stress levels loses value when the player is in the radius of a loud noise source and very gradually recover when it's outside of any noise.


OBSTACLES
DIFFICULTY
TIME AND LEVELS
There are a handful of different levels that parallel with the chronological evolution of industrialization and globalization of watercrafts. As time goes on it becomes more and more difficult to navigate the waters from the increase of noise pollution. There will be an increase of amount of ships but also an increase of radius around each obstacle. The modern and challenging levels includes commercial vessels, boating, air guns, military sonars, underwater construction, and seismic surveys. These ships have the most lethal effects on whales.
People of many ages play video games for hours and hours, and they also tend to invest their time and interest in topics if the game intrigues the players. This lead me to interactive video games as a platform to relay my message to the masses.
The main platform for the video game is focusing on the usage of headphones and a computer screen. This allows a majority of the population to be able to enjoy the game.
Another platform is Virtual Reality, this allows the player to completely immerse themselves into the game. The more the player is able to put themselves into the position of the whale, they are able to understand the reality of the mammals in the ocean.
song searching
There is a necessity to break the barrier of understanding the underwater world and empathizing with those who live in it. The purpose of this project is to raise awareness, so whether the player wins or loses, there is a message that directs the audience to further research, in hopes that people of all ages become more aware of the topic.
NRDC
Natural Resources Defense Council is an non-profit international environmental advocacy group.
International Fund for Animal Welfare is the largest animal welfare and conservation charities in the world.
IFAW

Next Steps

As we reach to the end of the book we've also come to the end of our first iteration of *Song Searching*. There's a lot of things to take away from this first attempt of the game that I've come to learn and so much I want to keep learning.

One of the most interesting events I was able to attend while working on *Song Searching* was a screening of *Sonic Sea* with an open Q&A section after. I had seen *Sonic Sea* 5 times before then, so I can definitely say I've seen *Sonic Sea* 6 times — and it's still amazing. The screening was hosted by International Society of Sustainability Professionals, the world's leading professional association of sustainability professionals. Working to make sustainability a standard practice by empowering professionals to advance sustainability in organizations and communities around the globe. I had only heard about the event was because I was in contact with Paul L. Sieswerda, Executive Director of New York's Gotham Whale, he explained that he wasn't able to attend the expert guest panel, but recommended it. Attending the panel instead was Kristi Ashley Collom, Research Associate at Gotham Whale. Other guest members were Nicole Carone and Robert A. DiGiovanni, Jr. the Founder and Chief Scientist from Atlantic Marine Conservation Society, an organization of biologists and volunteers with experience in marine mammal and sea turtle research and response. There were also many other scientists, field researchers, and even biology teachers attending. Given the opportunity to share *Song Searching* with them was extremely exciting because it was truly a first time I was able to engage the conversation with those who work directly with the topic.

To take further steps into joining the discussion of modern day pollutants and the marine ecosystem, I took two different classes hosted at Pratt: Planet Ocean and The Human and Animal Relationship. Two classes taught by Jennifer Telesca, an anthropoligist in the midst of her first book, *Marine Conservation in Times of Extinction: The Life and Death of Giant Tuna.*

During my semester in Planet Ocean, I was given readings surrounding the discussion on the complexities that follow the ocean. Less about the biology and biodiversity and focusing more on the rich and complex relations regarding the ocean. As both a society and individuals, we have a role in regards to the ocean and we are responsible for the actions we make that affect it.

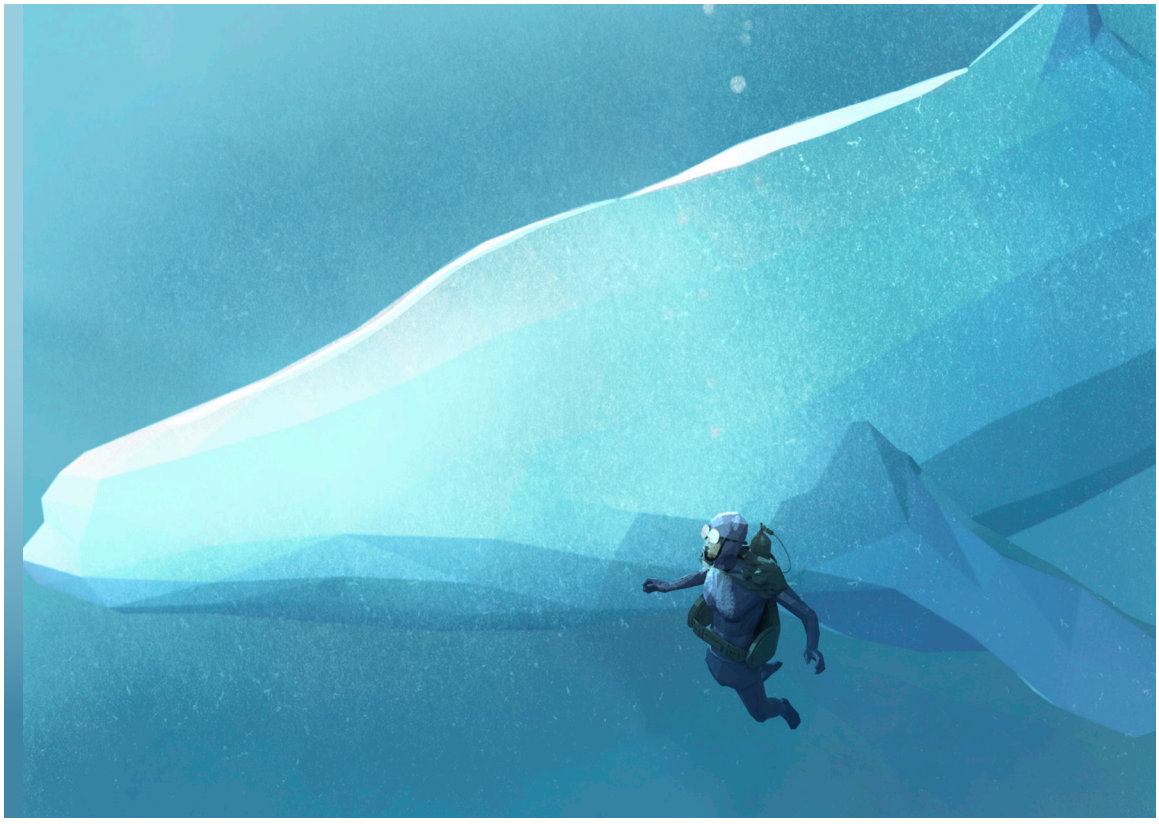
The Human and Animal Relationship class discusses the many different cases and instances how society has viewed the ocean either lesser or disregarded to empower and support the entitled and wealthy. The core of the class is the ethnographic relationship between humanity and animals through culture then analyzing how this is being constructed in our everyday.

With these newer experiences after starting this project, I realized that the first

iteration of the game doesn't have enough of an experience with the player and the whale themself. In the next iteration I would start focusing on the story of the humpback whales and the ocean itself. The game as itself, it addresses and sucessfully represents how noise pollution becomes a disturbance in the lives of humpback whales.

The ocean has become a bigger importance in my life after starting this project and I'm really thankful I was given the opportunity to make it this far. I encourage anyone and everyone to take the time to remember hwo the ocean helps and affects one's everyday life. How do you affect the ocean? How can you do better?

I would like to interview and meet more people in the field regarding these beautiful creatures and their lives. I want to also want to make better choices in regarding my role as a patron of this planet. In the end, for me, the ocean feels a little clearer and so much more beautiful than ever before.



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