**Game Storyline**

1 - Names: Anders C, Dawson H, Mason C, Ren C, Will Z

2 - Tentative Title: Fishing Frenzy

3 - Wickedness:

*1. There is no definitive formulation of a wicked problem*

It is almost impossible to completely formulate the idea of biodiversity and biodiversity loss, as there is such an extreme range of factors that go into its existence. In order to do so, one must also take into consideration the ways in which all of the factors intertwine. With the sheer amount of things that influence diversity, trying to formulate everything out is almost impossible.

*2. Wicked problems have no stopping rule*

As time progresses, an ecosystem will undergo constant changes, whether that be natural or human-inflicted. No matter how much one attempts to protect or fix a damaged ecosystem, there is no guarantee that it will stay healthy and the same forever. Thus, biodiversity has no “stopping rule”.

*3. Solutions to wicked problems are not true-or-false, but good-or-bad 🌟*

In the case of biodiversity loss, potential solutions are never black or white. There are no right-or-wrong solutions necessarily, but rather solutions have varying levels of success. The repeated taking of resources from ecosystems is harmful, deeming the action as “bad.” On the opposite end of the spectrum, considerate farming of resources from an ecosystem while taking into account the potential damage that could be inflicted upon it, and changing methods because of that, would be a “good” action.

*4. There is no immediate and no ultimate test of a solution to a wicked problem 🌟*

The results of any potential solutions (big or small) against biodiversity loss have no immediate test to gauge their effectiveness. While researchers have ways of sampling the numbers of endangered species to test their recovery, it is impossible to completely monitor the entire population or the species’ relationships within the ecosystem. Similarly, there is no ultimate test of potential solutions, as there isn’t a specific point where biodiversity loss has been prevented.

*5. Every solution to a wicked problem is a “one-shot operation”; because there is no opportunity to learn by trial-and-error, every attempt counts significantly*

Most potential solutions against biodiversity loss require extensive funding, research, and resources. Examples include preserving and restoring nature on a massive scale, completely switching over to sustainable energies, and monitoring and safeguarding endangered species.

*6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan*

The potential solutions mentioned in several answers are very few. There are definitely many other potential solutions out there, with actions/operators that cannot be contained in a “well-described set”. Solutions could be created from anywhere in the fields of technology, agriculture, energy, resource distribution and management, and more.

*7. Every wicked problem is essentially unique*

Though biodiversity loss is rooted in many different problems, it itself is a unique problem. No other problem deals with the implications of species population decline and/or extinction and its effects on the other organisms in its ecosystem.

*8. Every wicked problem can be considered to be a symptom of another problem*

As mentioned above, biodiversity loss is a symptom of many other problems. According to the IPBES report, the five primary sources of biodiversity loss are changes in land and sea use, direct exploitation of organisms, climate change, pollution, and invasive alien species.

*9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.*

Biodiversity loss is often attributed to a few different factors: change in land use, exploitation of organisms, climate change, and invasive species. Depending on the factor that one focuses on, the solution will be different.

*10. The planner has no right to be wrong 🌟*

When humans destroy an ecosystem and cause a great loss of biodiversity, it can lead to species extinction as well as a complete change in the natural habitat for many of the species that had originally lived there. This change often destroys the climate of the ecosystem, and the damage can take many years to reverse if restoration is even possible. Biodiversity loss is related to climate change, pollution, and resource overconsumption, subjects that some people find controversial (for example, there are people who doubt the existence and effects of climate change). This means that if the planner is unsuccessful in providing positive results against biodiversity loss, they could face consequences from not only the organisms at risk but also from their stakeholders, people with governmental power, and the general public.

*11. Explain the extent to which there exist multiple stakeholders for your problem, and what conflicts exist among them 🌟*

As stated by IPBES Chair, Sir Robert Watson, “Transformative change can expect opposition from those with interests vested in the status quo, but also that such opposition can be overcome for the broader public good”. There would generally be three stakeholders for our problem: associations, companies, and individuals. These three would have different environmental value systems. One being ecocentric, this stakeholder believes that nature would be more important than humanity and that we should do anything possible to avoid biodiversity loss. The second stakeholder would be anthropocentric, which believes that humans come first but should sustainably manage our environment and that humans should prevent biodiversity loss as we are dependent on nature. The last being technocentric, this stakeholder believes that technological developments can solve environmental problems, so they’ll most likely support economy and efficiency over sustainability.

4 - The Setting:

It is the year 2025, and you (the player) have found yourself working at a large-scale fishing company – WARMD. Congratulations! Your job position puts you in charge of deciding the methods WARMD will use for fishing in the future. WARMD primarily fishes in salt water, catching only a select variety of fish. As the only fishing company in the area, local consumers can only buy whatever WARMD sells. In the past, WARMD had a bad history of overfishing and throwing away bycatch. The previous employee in charge of making these decisions has been fired as a result of years of destructive choices. Now, you must not only sway the public’s opinion on the sustainability of WARMD but also make sure that the company’s future will continue to be successful while keeping the fishing ecosystem sustainable and healthy.

This game primarily focuses on the ways in which human activity can cause biodiversity loss. More specifically, the extent to which different fishing methods can negatively affect the biodiversity of an oceanic ecosystem. The game incorporates the ideas of pollution, overfishing, and bycatch, and how these concepts can change the biodiversity of an area, harming the life that had originally lived there.

While related to biodiversity loss, the concepts of climate change and invasive species are not touched upon in this game. Climate change as a whole would be much too complex to incorporate within this fishing game and would have no real connection to the actions of the player (a single person, even one in charge of a fishing company, cannot do anything significant to combat climate change). Similarly, with the concept of invasive species, the average person usually cannot control the influx of invasive species.

5 - Initial Situation:

The player is first presented with an untouched, healthy, thriving ecosystem that their company aims to begin fishing in. The player then has to make a choice regarding the type of fishing they believe will be best for maintaining biodiversity while still increasing profits for the company. With respect to the player’s decision, the amount of profit the company earns will change, as well as the [metric of measuring biodiversity].

6 - Roles:

There will only be one role in this game. The single player will act as head of the fishing company’s methods and will have to correspond with the company’s boss and customers’ requirements. The player’s company is the only company in our game, so there is neither collaboration nor competition.

7 - Objective:

The player will try to complete their company’s task successfully (making as much profit as possible) without causing huge damage to the environment and the ecosystem (biodiversity loss). The player will have to consider the pros and cons of each fishing method (associated costs, bycatch percentages, method effectiveness) before making the best decision as they see fit.

8 - Player Affordances:

Each player can choose the method of fishing provided in the game to catch the target species. There are operators including catching fish with a net, catching fish with long lines, catching fish using gillnets, and so on. Players should consider which type of fishing fits the target species the most and also be aware of the way that would cause less damage to other species and ecosystems. Players will be able to see the company's goals and customers’ requirements. Players also have to deal with random events happening near the company that would lead to biodiversity loss in marine ecosystems. For instance, industrial pollution, hurricanes, and tsunamis. There is only one role for the player.

**Implementation Considerations**

1 - Initial State:

*Variables*: Money, Biodiversity score, Amount of fish in the ocean, Method of fishing, Rounds left

*Initial values*: 0, 100, tbd, 0 = ‘Do nothing’, 12

*Possible additional variables*: Cost, Pollution, Special events

2 - Operators:

The player would choose to catch fish with a net; this operator would change all the variables involved in the state.

3 - Goals and Scores:

There is not an exact number of points that act as a goal state, but there will be a scoring facility implemented so that the player will try to reach a high score. There will be a system that retains the amount of money the company makes, as well as a system that measures the damage the player does to the ecosystem. The player must attempt to keep the amount of money as high as possible, without lowering the metric of biodiversity loss.

4 - Specification of First Working Code:

In our Initial state, the ecosystem would be “healthy” with 100 cod and 100 herring. The game ends when 12 rounds have passed or when there are no more fish. The player takes on the role of the decision maker of a fishing company. In this “pre-alpha” version, the only operator phi-0 is “Using a net to catch more than one fish species”, which allows the player to catch 25 cod and 25 herring out of the ocean. Precondition always returns True. There are 3 state variables, including the number of cod and herring in the ocean, and the number of rounds left.

5 - Specification of Second Working Code:

There will be only one role that the player takes, which is the decision maker of the fishing company. There would be 5 state variables, including profit of the company, the number of cod and herring in the ocean, rounds left, and biodiversity index (Simpson’s Diversity Index). In the Initial state of this version, profit would start at 0, there would be 100 cod and 300 herring, and rounds left would be 12. Precondition returns True unless there are no more fish and the choice isn’t to ‘do nothing’. There are 3 operators: phi-0 “Do nothing”; phi-1 “Using gill nets to fish”, which allows the player to fish a random number of cod between 20 and 30, and herring between 60 and 80; phi-2 “Using longlines to fish” allows the player to fish a random number of cod between 20 and 40, and herring between 40 and 80. These numbers in this version are currently not related to real data. A simple reproduction mechanism with a ×1.25 multiplier for each round is also added.