

CASE STUDY: MODELLING TRADITIONAL COAST SALISH FISHING PRACTICES WITH OPEN SCIENCE AND THE JUPYTER ECOSYSTEM

LAURA GUTIERREZ FUNDERBURK, DECEMBER 17 2021

AGU FALL
MEETING

SCIENCE
is SOCIETY





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**DATA SCIENTIST
CYBERA INC.**





MOTIVATION

The Tla'amin First Nations peoples have lived on the Sunshine Coast in British Columbia, Canada for thousands of years.

Use of “Fish traps” - intertidal modification to facilitate harvesting fish.

Settler arrival and industrial harvesting -> changes to environment and landscape.



Tla'amin Nation Fish Traps. Photograph provided by the Tla'amin Nation



Canoe ride. Photograph provided by the Tla'amin Nation

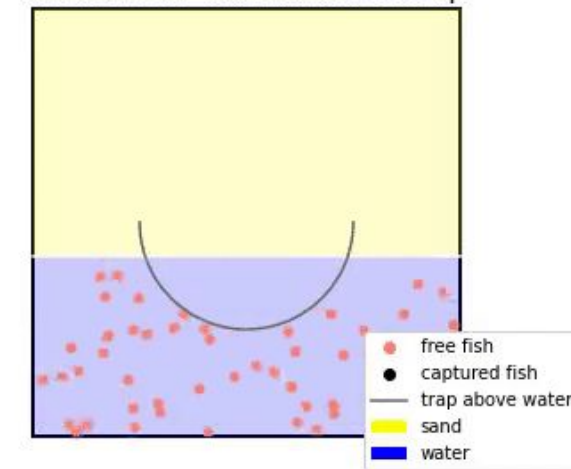


MAIN FINDINGS

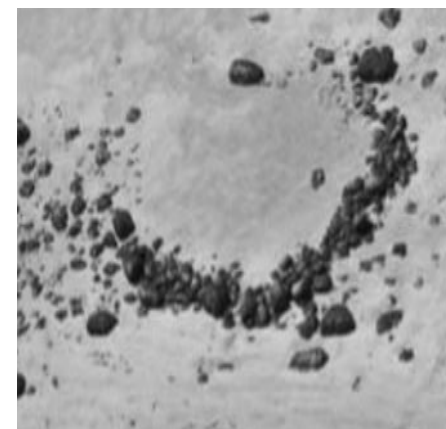
Using Python pandas, matplotlib and plotly packages, we developed a set of scripts that:

1. Parse open tide data for the Tla'amin Nation area.

Aerial View - Animation of Trap



Python simulation of trap



Combes, et al. (2012). A Bird's Eye View of Northern Coast Salish Intertidal Resource Management Features, Southern British Columbia, Canada.

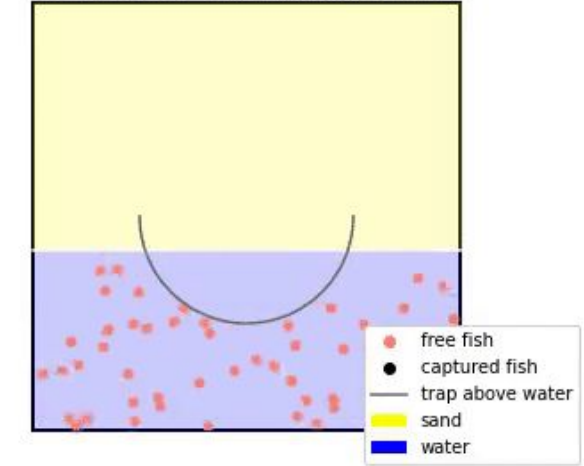


MAIN FINDINGS

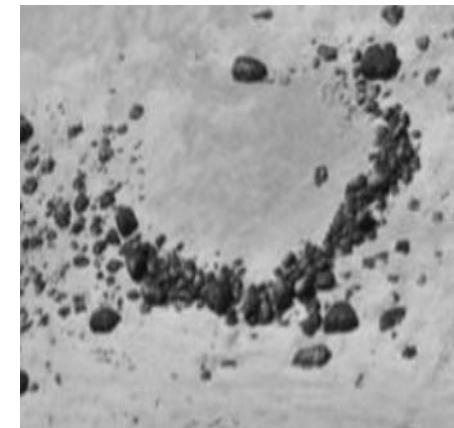
Using Python pandas, matplotlib and plotly packages, we developed a set of scripts that:

2. Implement a deterministic model of the crescent element trap with 1000 fish.

Aerial View - Animation of Trap



Python simulation of trap



Combes, et al. (2012). A Bird's Eye View of Northern Coast Salish Intertidal Resource Management Features, Southern British Columbia, Canada.

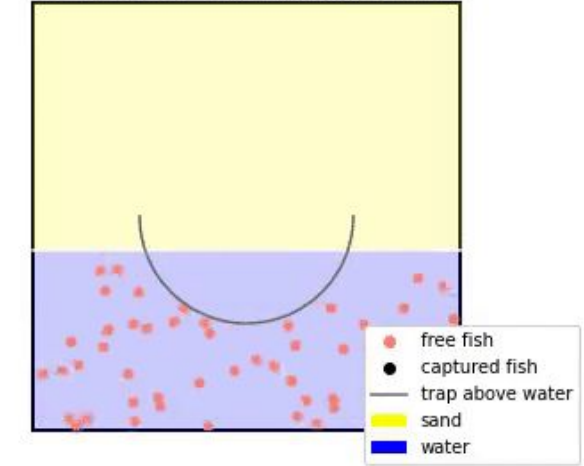


MAIN FINDINGS

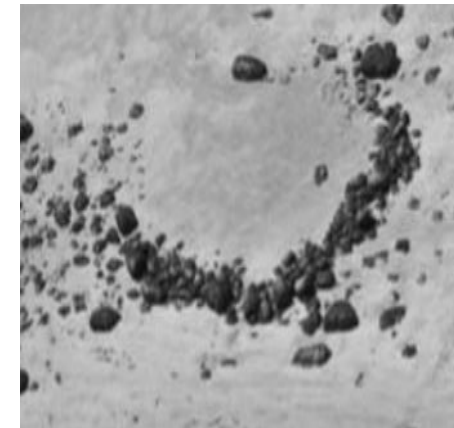
Using Python pandas, matplotlib and plotly packages, we developed a set of scripts that:

3. Implement a user interface menu within **Jupyter** to observe impact of changing location of trap, height of trap.

Aerial View - Animation of Trap



Python simulation of trap



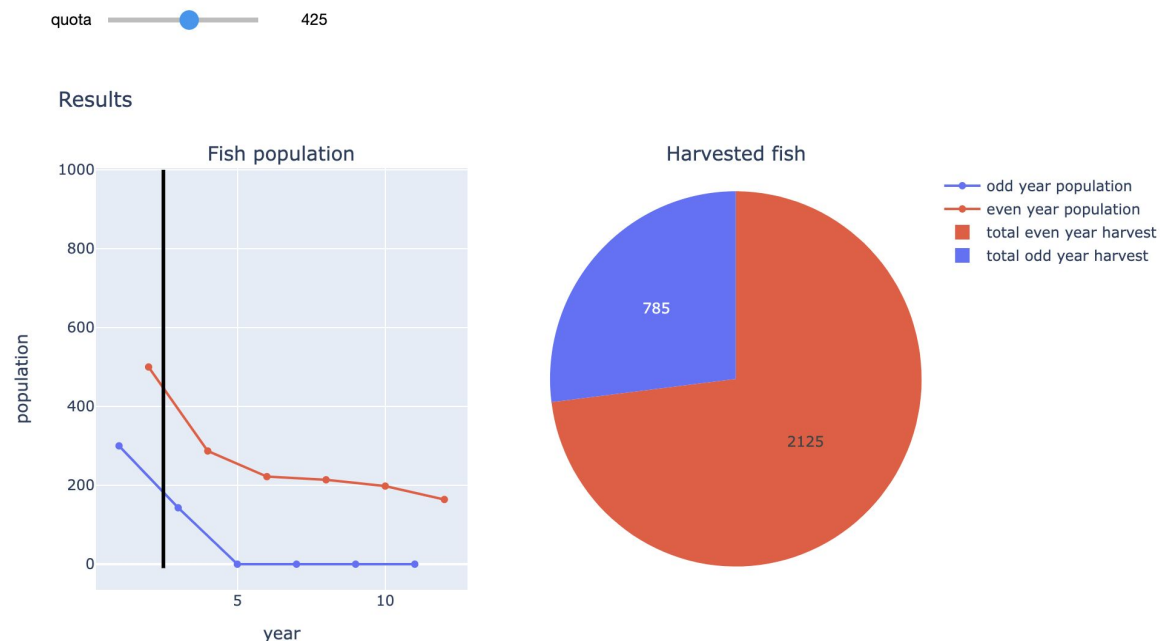
Combes, et al. (2012). A Bird's Eye View of Northern Coast Salish Intertidal Resource Management Features, Southern British Columbia, Canada.



MAIN FINDINGS

Furthermore:

4. Study the impact of various quota over the course of 10 years for pink salmon populations.



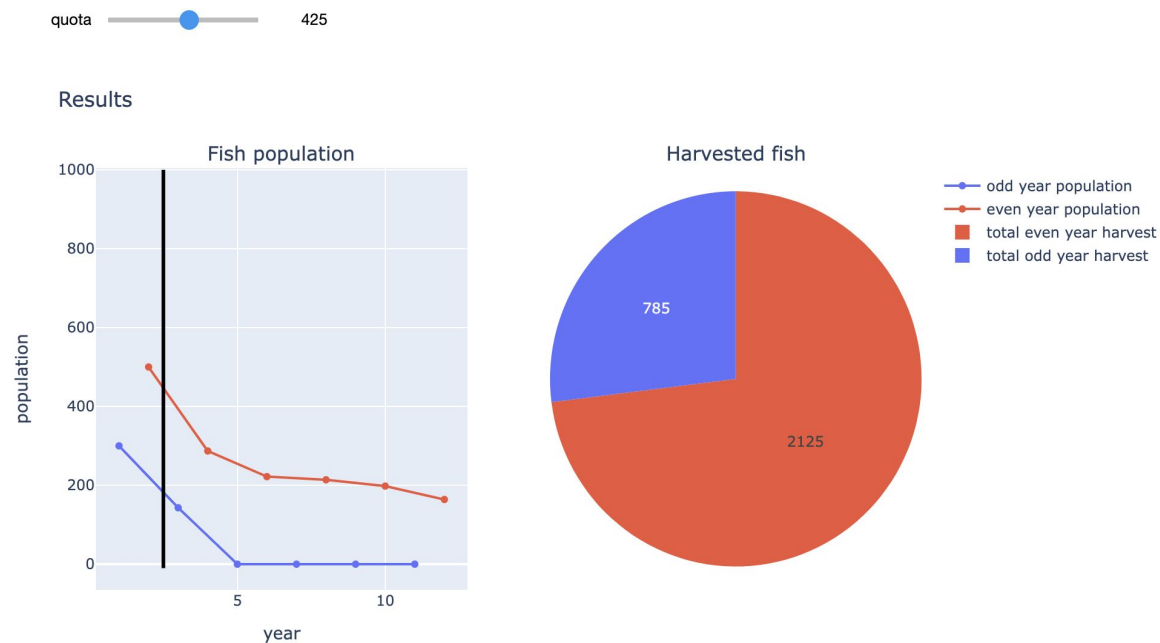
Python harvest simulation



MAIN FINDINGS

Furthermore:

5. Observe high degree of complexity involved in designing, building and using trap.



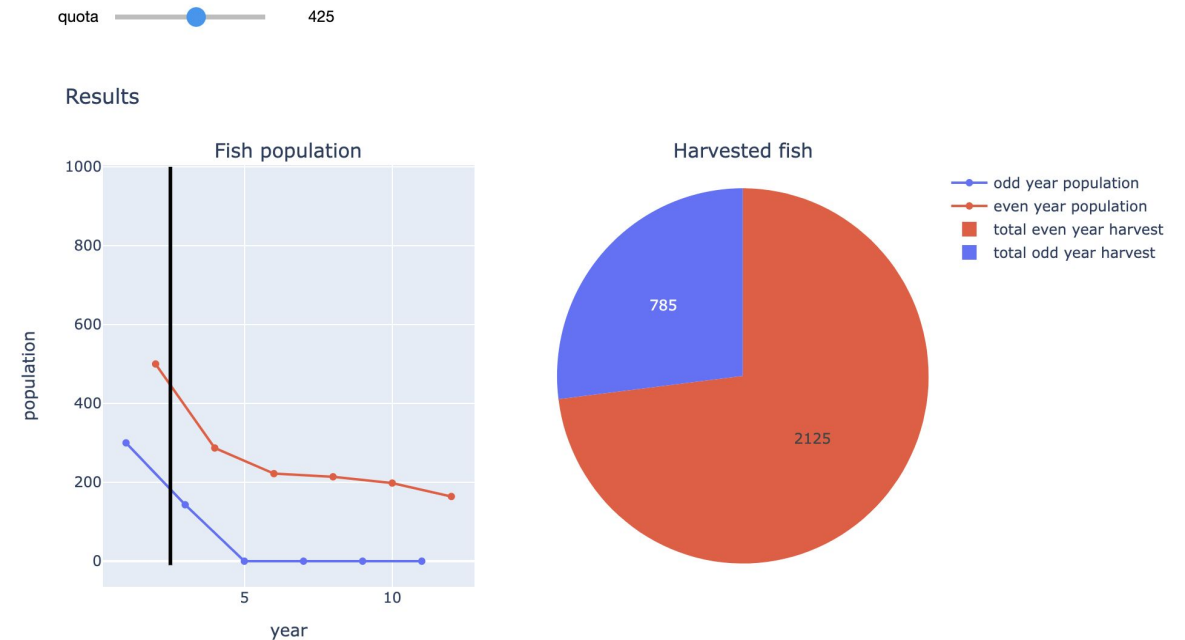
Python harvest simulation



MAIN FINDINGS

Furthermore:

6. Observe the impact of higher yearly quotas -> population extinction.



Python harvest simulation



CULTURAL RICHNESS AND OPPORTUNITIES FOR LEARNING

Through this work our team learned the **impact of colonization on the Tla'amin nation** and on the **fish populations** in the area.

Open science and **open source projects** like **Jupyter** to **advocate for policy to reduce overharvesting**.



Herring egg spawn, Carol Wyatt, Tla'amin Nation



CULTURAL RICHNESS AND OPPORTUNITIES FOR LEARNING





CULTURAL RICHNESS AND OPPORTUNITIES FOR LEARNING

Open data, open source code and open science to empower youth.



CULTURAL RICHNESS AND OPPORTUNITIES FOR LEARNING

Open data, open source code and open science to facilitate cross cultural understanding.



CULTURAL RICHNESS AND OPPORTUNITIES FOR LEARNING

Partnership is a key component.

Without the Nation's **openness** and **trust**, we could not have shared this knowledge with you.



THE COLLABORATION



Tla'amin Nation: Betty Wilson, Gail Blaney, Tyler Peters, **SFU:** Bryce Haley, Laura G.F., Veselin Jungic (PI), Cedric Chauve (PI).
Together through the Callysto project.





HOW WE DID IT

Through a JupyterHub hosted in Canada (the Callysto Hub), we developed and curated educational materials.

Through the Callysto Hub, Canadian developers can create, modify, save and share content on the cloud.





HOW WE DID IT

We packaged code into reusable scripts.

We developed user interfaces, interactive Jupyter notebooks and lesson plans.

We then used the Callysto Hub to disseminate knowledge with instructors and students.





YOU CAN DO IT TOO!

This case study serves to illustrate what is possible.

Let's explore it together.

Part I: Parameters of a fish trap <https://tinyurl.com/y37hrspp>

Part II: Impact of overharvesting <https://tinyurl.com/y6cdcw2n>



KEY TAKEAWAYS

The Tla'amin Nation members possess a **high degree of social organization, knowledge of tide behaviour** and **marine wildlife** that allow them to support the community.



KEY TAKEAWAYS

High levels of harvesting over the years can lead to **species extinction** and with this **changes in ecosystem balance**.

Social implications include **scarcity for marginalized populations**.



KEY TAKEAWAYS

Through open science, open data and open source projects like Project Jupyter and the Callysto Project we can **learn, empower, and advocate for change.**



WHERE TO LEARN MORE ABOUT CREATING YOUR OWN MODULES

Get started with Callysto for instructors:

<https://www.callysto.ca/starter-kit/>

Callysto online courses:

<https://www.callysto.ca/distance-learning/>

THANK YOU

YOU CAN FOLLOW CALLYSTO ON TWITTER
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