Iḷisaġvik College Student Panel

August 3, 2022
75th Anniversary of NARL

ILISAĠVIK COLLEGE

ALASKA'S ONLY TRIBAL COLLEGE

ILISAGVIK.EDU

Research Activities

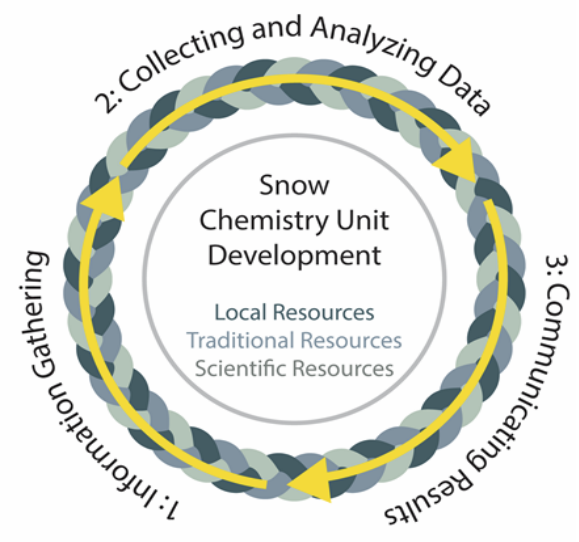
- Snow Chemistry: Researching Apun
  - Basic Chemistry
  - Climate Change
  - Indigenous Science

- Arctic Microbe Project
  - Indigenous Science
  - Microbiology

Researching Apun: A culturally responsive chemistry research unit for college students in Arctic Alaska

Students Draw on Local, Traditional, and Scientific Resources

Researching Apun: A culturally responsive chemistry research unit for college students in Arctic Alaska



Section	Activity
Information Gathering	**Listened to Iñupiaq Elder stories**
	Gathered sources: articles, books, etc.
	Interviewed community members
	Snow Chemistry POGIL (guided inquiry)
	Summarized knowledge and developed a research question
Collecting snow and analyzing data	Designed experiment for snow sampling
	Session with Arctic Researcher
	Collected snow
	Performed chemical snow measurements
	Completed data analysis
Communicating results to community	**Students presented their snow chemistry project stories and reflections**

Student 1: Caribou Migration in Utqiaġvik

Elder talk
Caribou dig through layers of snow to find water

Connections
Personal experience with hunting

Research Question
What are the differences in chloride concentration based on proximity to caribou herds and snow depth?

Researching Apun: A culturally responsive chemistry research unit for college students in Arctic Alaska

Student 2: Concentration of Ions (site #11)

Student Speakers

- Joyce Stotts
- Daphne Muller
- Garrett Taylor
- Ana Stringer
- Kimberly Pikok

Joyce Stotts Iḷisaġvik College Student

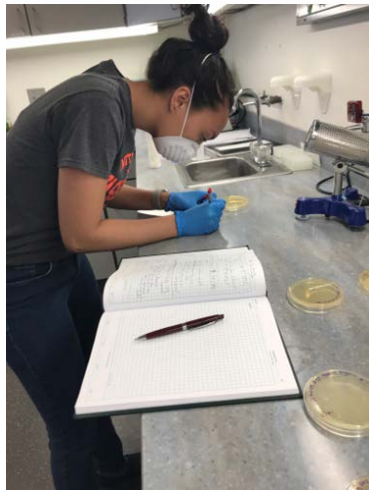
- Born in Anchorage and raised in Utqiaġvik
- Introduced to research in basic chemistry class
- Summer work with the National Ecological Observatory Network (NEON)
  - Trapping mosquitos and beetles
  - Plant observations
  - Photos for area leaf index
- Fall 2022 and Spring 2023
  - Chemical analysis of snow

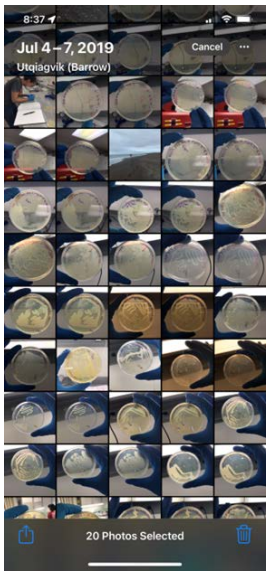
Daphne Mueller and Garrett Taylor
Ilisagvik College Opportunities

- Dual credit courses for high school students
- Get a head start on degrees
- First introduction to research
- Continued work into college

Arctic Microbes: Easing Into Research

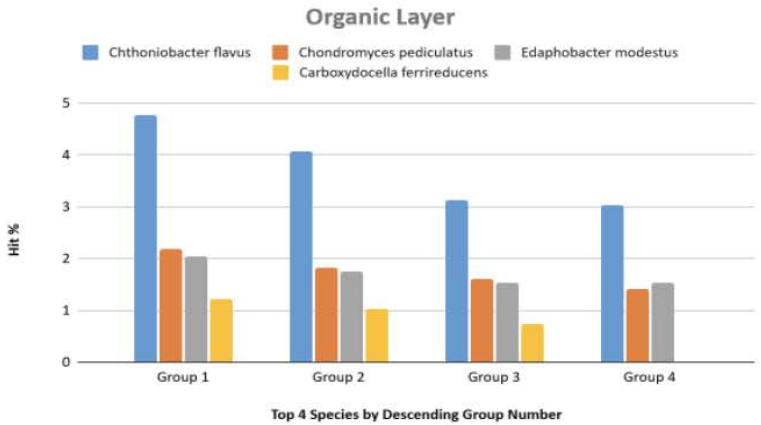
- Lab Skills
  - Culturing
  - Technological trainings
  - Pipetting, accurate measuring, etc.
- Mentorship
- Communication
- Scientific jargon

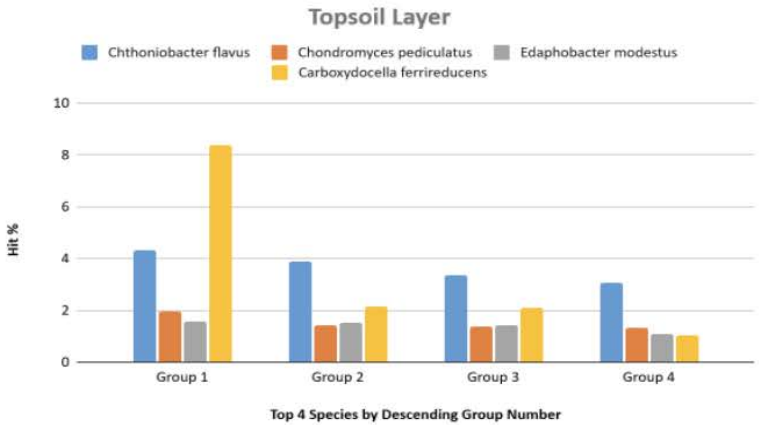


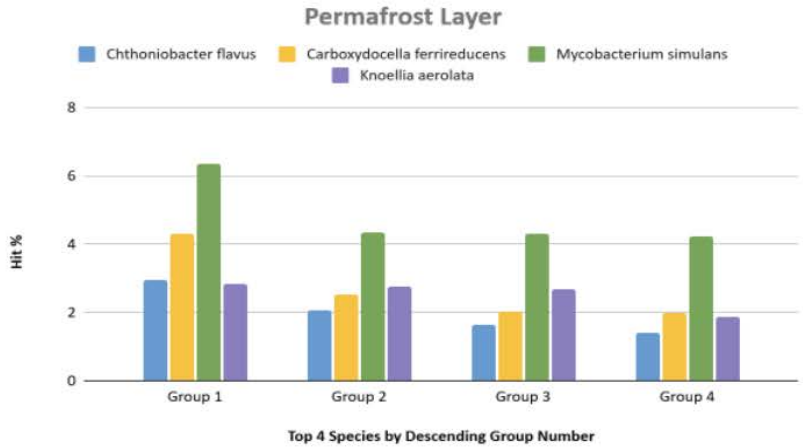


Arctic Microbes: What We Found

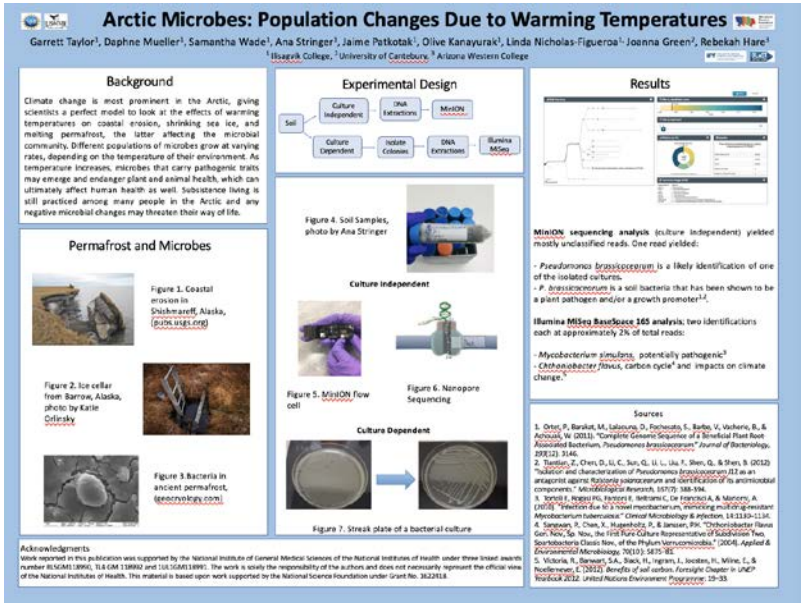
- Sequenced DNA extracted from soil samples
- Wide range of microbes
- *Cthoniobacter flavus* (blue bar) consistently found across all layers: contributes to release of CO_2 from soil[1]
- *Mycobacterium simulans* (green bar) dominated permafrost: can cause pulmonary disease[2]

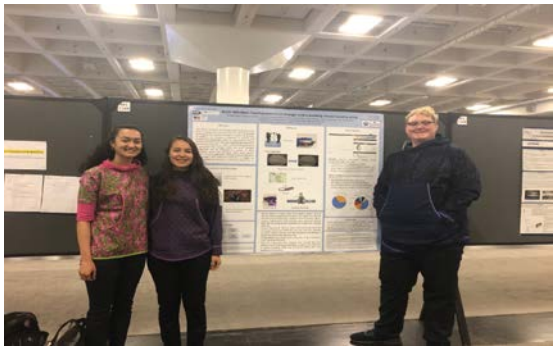




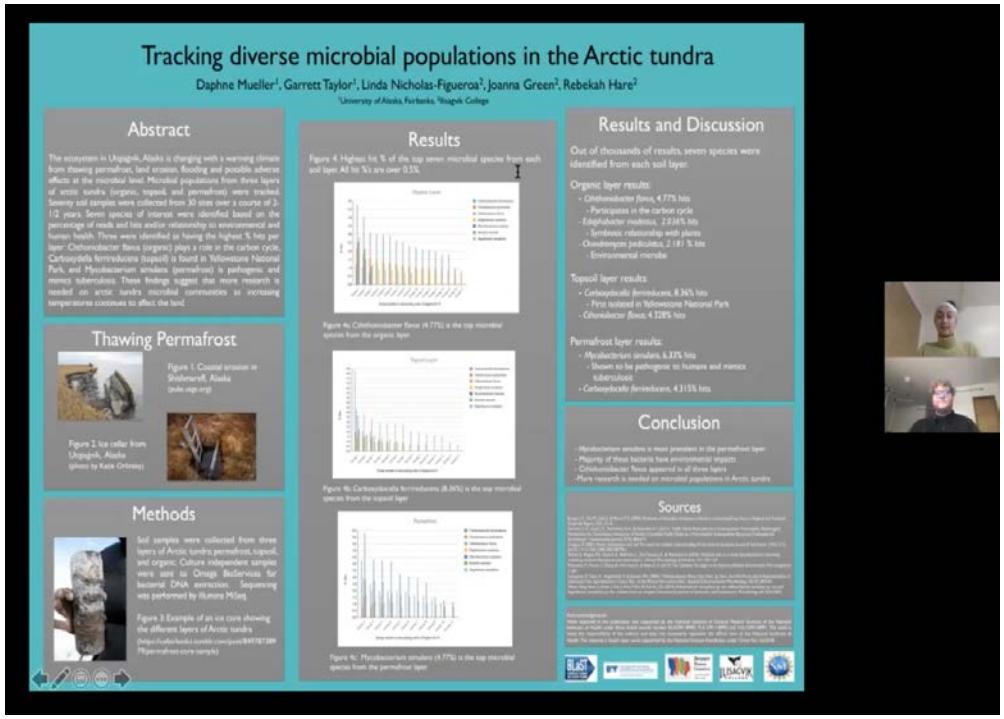


Arctic Microbes: Presenting Research





American Society of Microbiology
San Francisco, CA, June 2019



University of Alaska Fairbanks, One Health Conference, 2021

Other presentations

- Diversity Consortium Program Virtual Symposium, 2020
- CHEM 481 Chemistry Seminar Spring 2021

Projects at the University of Alaska Fairbanks

Microbial community diversity in sediment and water from the Chena River

Daphne Mueller, J. Andrés López, Mario Muscarella
University of Alaska Fairbanks

Introduction

- River ecosystems contain unique microbiomes
- Different microbiomes based on environment: water vs. sediment
- Microbiomes reflect their surrounding environments
- Anthropogenic activities alter microbial composition
- What difference will we find between sites running through Fairbanks and sites further from town?

Methods

Figure 1: Sample sites along the Chena River. Yellow markers are out-of-town sites, purple are in-town, and black is the Tanana river.

- Collected 2 water and 2 substrate samples

Figure 2: Collecting substrate samples

Figure 3: Prepping filters for DNA extraction

- Isolated DNA from samples
- Prepared DNA for sequencing on Illumina instrument
- Processed sequences through Qiime

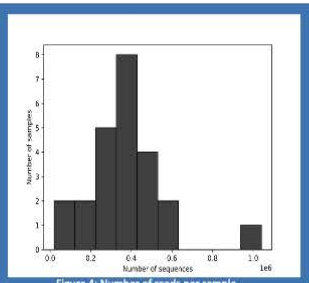


Figure 4: Number of reads per sample

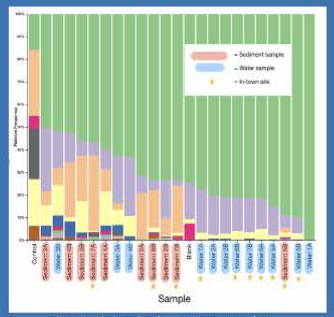


Figure 5: Phylum distribution among samples

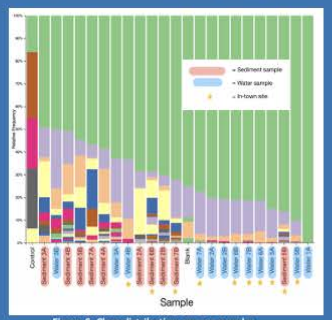


Figure 6: Class distribution among samples

Results

- Average of 370,000 reads per sample
- Sample with lowest number of reads (19,585): Water 1A
- Sample with highest number of reads (1,040,796): Substrate 2B
- Substrate samples across sites were more diverse than water samples
- Top four phyla: *Bacteroidota*, *Proteobacteria*, *Firmicutes*, and *Cyanobacteria*
- *Firmicutes* (orange in Figure 5) comprised, on average, 16.305% and 0.77% of substrate and water samples, respectively

Discussion

- *Firmicutes*, commonly found in both water and soil, were in higher abundance in substrate samples
- *Firmicutes* are associated with the human microbiome
- Sites 5 and 6, located in Fairbanks, and have lower microbial diversity

Future Directions

- Seasonal sample collections
- Water and soil chemistry
- Deeper analysis between sites

Sources

- Gibbons, S. M., Jones, E., Bearquiver, A., Blackwolf, F., Roundstone, W., Scott, N., Hooker, J., Madsen, R., Coleman, M. L., & Gilbert, J. A. (2014). Human and environmental impacts on river sediment microbial communities. *PLoS ONE*, *9*(5). https://doi.org/10.1371/journal.pone.0097435
- Reddington, K., Eccles, D., O'Grady, J., Drown, D. M., Hansen, L. H., Nielsen, T. K., Duckworth, A. L., Leggett, R. M., Heavens, D., Peel, N., Snutch, T. P., Baugas, A., Dimopoulos, S., Baguioni, I., Barry, T., van der Heijden, C. D. D., Richardson, H., Jansen, H., Tyson, J. R., … Brown, B. L. (2020). Metagenomic analysis of planktonic riverine microbial consortia using nanopore sequencing reveals insight into river microbe taxonomy and function. *GigaScience*, *9*(6), giaa053.
- Ulrych, D. R., Good, S. P., Crump, A., Warwick, J., & Jones, G. D. (2020). River microbiome composition reflects macroscale climatic and geomorphic differences in headwater streams. *Frontiers in Water*, *2*. https://doi.org/10.3389/frwa.2020.574728
- Wang, L., Zhang, J., Li, H., Yang, H., Peng, C., Peng, Z., & Lu, L. (2018). Shift in the microbial community composition of surface water and sediment along an urban river. *Science of The Total Environment*, *627*, 600–612. https://doi.org/10.1016/j.scitotenv.2018.01.203

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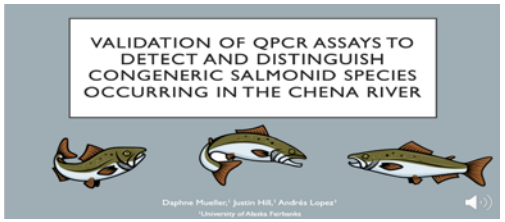


American Fisheries Society Alaska Chapter, March 2021

Daphne's Future Plans

- Finishing senior thesis: "Microbial community diversity in sediment and water from the Chena River"
- Graduating Fall 2022 (December)
- Gain more experience!
- Attend graduate school

Projects at the University of Alaska Fairbanks and Ilisagvik

AAAS (Feb. 2019)

FEOI (Fall 2020/Spring 2021)

Camera Sorting of trail use (Spring 2020)

MINIon Workshop (Oct. 2018)

Climate Scholars Program (Current)

Garrett's Future Plans

- Undergraduate degree spring 2023
- Looking into master's program in microbiology

Ana Stringer

About Me

'Ana Fononga va'inga Stringer

- Tongan
- Graduated from Barrow High School in 2018
- Enrolled in Ilisagvik's dual-credit program in 2015 & graduated with A.A. in Liberal Arts in 2018
- Conducted research at Ilisagvik on Arctic Microbes from 2017-18 and first authored a paper published in the Native Science Report
- Graduated from Vanderbilt University in May 2022 with Bachelor's in Environmental Science & Environmental Sociology
- Served on CAFF Youth Advisory Board & interned at the Polar Institute
- Will be attending University of Washington pursuing my master's in Marine Affairs this fall!

Experience at Iḷisaġvik College

Dual-Credit Classes at Iḷisaġvik College (2015-2018)

- Prepared me for more rigorous, college-level courses
- First exposure to research and scientific writing

Experiences with NSB- DWM

Internship with the NSB Department of Wildlife Management (2019-Present)

- Played a critical role in helping define my career and academic aspirations!
- Learned about co-management structures and marine governance

Next steps

NARL & My Academic and Career Journey

SMEA
UW SCHOOL OF MARINE & ENVIRONMENTAL AFFAIRS

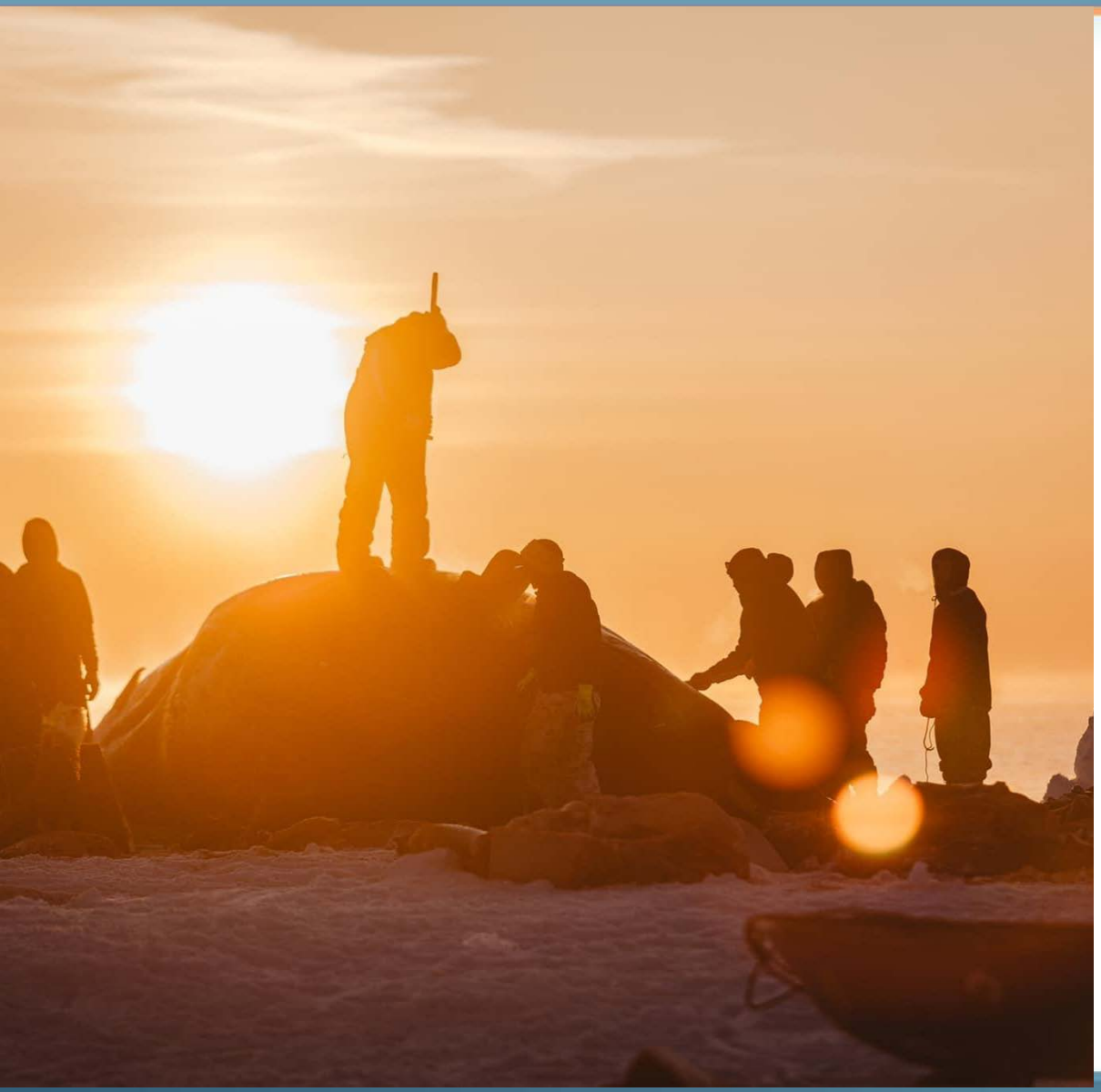
- NARL provides mechanisms for local & Indigenous peoples to shape –and be actively involved in –local science and policy, something very unique to our region!
- Pursuing my master's in marine affairs this fall to investigate the role of tribal entities in creating equitable climate mitigation strategies

Kimberly Kivvaq Pikok

- Dual Credit Courses at Iḷisaġvik 2015-2016
- Graduated from Barrow High School in 2016 with 8 college credits completed
- 3 of the UAF general education requirement courses for my degree program were completed at Iḷisaġvik

- Graduated in May 2021 with a Bachelor of Science in Wildlife Biology
  - Inuit Circumpolar Council – Alaska intern (2017)
  - Haskell Indian Nations University Summer Intern (2019)
  - NSB Wildlife Management College Intern (2018- Present)

- UAF Graduate School (2021- 2024)
  - Tamamta Fellow – Master of Science: Interdisciplinary Studies
  - Graduate Student Researcher for the Alaska Arctic Observatory and Knowledge Hub



- Determine the seasonal changes in Utqiagvik's spring whaling using hunter and whaler long-term observational data from the Alaska Arctic Observatory and Knowledge Hub
- Create a youth engagement strategy/ pilot program for Arctic Alaska Native co-management organization(s) to implement

References

1. Swangwan, P., Chen, X., Hugenholtz, P., & Janssen, P.H. (2004). Chthoniobacter Flavus Gen. Nov., Sp. Nov., the First Pure-culture Representative of Subdivision Two, Spartobacteria Classis Nov., of the Phylum Verrucomicrobia. *Applied & Environmental Microbiology*, 70(10): 5875-81.

1. Tortoli. E., Rogasi, P.G., Fantoni, E., Beltrami, C., De Francisci, A., & Mariottini, A. (2010). Infection due to a novel mycobacterium, mimicking multidrug-resistant Mycobacterium tuberculosis. *Clinical Microbiology & Infection*, 14:1130-1134

Quyanakpak

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