Welcome
ARCUS Arctic Research Seminar Series

Community Science in Arctic Research and Observing – Past, Present, and Future
10 April 2019

Presenters:
• Elena Sparrow (UAF, GLOBE, Winterberry Project)
• Marilyn Sigman (Alaska Sea Grant),
• Michael Køie Poulsen (NORDECO, INTAROS), and
• Ted Cheeseman (Polar Citizen Science Collective)
Thank You!

- International Arctic Science Committee (IASC) for co-hosting today’s seminar
- University of Alaska Fairbanks and the International Arctic Research Center for providing our venue for today’s in-person seminar
- National Science Foundation Office of Polar Programs for financial support to ARCUS and this seminar series
Elena Sparrow

Engaging Youth and Community Members in Scientific Investigations and Civic Action Through Citizen Science

- Education Outreach Director and Research Professor
- International Arctic Research Center, University of Alaska Fairbanks
- GLOBE
- Winterberry Project

Background photo by Ute Kaden
Engaging Youth and Community Members in Scientific Investigations and Civic Action Through Citizen Science

Elena B. Sparrow, Ph. D.
Education Outreach Director, Research Professor

Katie V. Spellman, PH.D.
Research Assistant Professor
What is Citizen Science?

- Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions. (Oxford English Dictionary)

- Other names for partnerships between scientists and non-scientists to conduct scientific research
  - Community science
  - Community-based monitoring
  - Voluntary biological/physical monitoring
  - Participatory Research
  - Public Participation in Scientific Research
## Citizen Science Program Spectrum

<table>
<thead>
<tr>
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<th>Theoretical or generalizable needs</th>
<th>Local community needs</th>
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Citizen Science in Alaska, the Arctic and Worldwide

https://www.globe.gov
GLOBE Science Investigation Areas

Atmosphere-Air
Hydrosphere-Water
Biosphere- Life
Pedosphere-Soil
GLOBE Basic Protocols

Atmosphere/Climate
- Cloud
- Temperature
- Precipitation

Hydrosphere
- Hydrology
  - Transparency
  - Temperature
  - pH
  - Conductivity
  - Salinity

Pedosphere
- Soil
  - Field Characterization
  - Bulk Density
  - pH
  - Temperature
  - Gravimetric Moisture

Biosphere
- Land Cover / Biology
  - MUC
  - Qualitative Land Cover Sampling
  - Quantitative Land Cover Sampling
  - Manual Mapping

Green-up/green-down

Frost Tube
Phenological Investigations

Green-up

Observe

Measure

Green-down

Enter data

Record data
Green-up Cards learning activity
Looking at the Data

Green-Up of *Betula Papyrifera*
Innoko River School, Shageluk, AK, US
Spring, 2005

Leaf Length (mm)

May

- Leaf 1
- Leaf 2
- Leaf 3
- Leaf 4

Bud Swelling
Bud Burst
Greenup & Greendown Annual Site Profile
OSAKA PREFECTURAL HIGASHISUMIYOSHI TECHNICAL HIGH SCHOOL
2002: GRN-02 PHN-GUGD2
135.5437°E, 34.6133°N, 5.2 m, site type LCB,
Site comments:
Nearest ATM site: ATM-01 ATM-1
135.5489°E, 34.809°N, 5.2 m, at distance 0.0 m, in direction N
T GENUS/SPECIES: Cornus/Florida, Dogwood

dormant

swelling

budburst

growing

color change

lost/fallen

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<tr>
<th>Level 0 (cm)</th>
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<td>180</td>
<td>130</td>
<td>80</td>
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Daily Temperature

Daily Precipitation

Daily Atmosphere Measurements

max T  min T
Student Outcomes

Phenology Studies

Mat-Su Career & Technical H. S. students helped U.S. Fish and Wildlife Service scientists

Collaborative Budburst Study

Students from two schools for the deaf
Presented at a GLOBE Learning Expedition
In South Africa
Scientific Publications


## Citizen Science Program Design

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### Theoretical or generalizable needs
- Publishable dataset,
- Large scale policy impact,
- Slower timescale

### Local community needs
- Individual learning,
- Local policy impact,
- Rapid timescale

(From Bonney et al. 2015, Danielsen et al. 2009, Danielsen et al. 2010)
Designing for outcomes across scales: A hybrid model

- Personalized, facilitated match making starting with local needs and priorities
- Theoretical or generalizable needs
- Local community needs

- Community investigations and stewardship action projects on local climate change issue co-identified by youth, elders, educators, and scientists aligned with large-scale citizen science project (GLOBE, etc.)

- Publishable dataset, Fill gaps in large scale dataset, Large scale policy impact
- Individual learning, Critical data now, Local policy impact

Learning and data at multiple scales
Designing for generational and cultural diversity: culturally responsive learning framework

**SHARE**

Learn from elders, long-term residents, and scientists about signs and impacts of climate change.

**APPLY**

Make sense of research by analyzing data and reviewing information from local experts, NASA data, and existing research.

**EXPLAIN**

Collaborate with a scientist & community to develop and implement investigation.

**EXPLORE**

Do culturally responsive activities to establish knowledge base

- Talk with a NASA scientist
- Select inquiry question
- Identify aligning larger scale cit sci efforts (GLOBE, etc)

Discover what youth and adults know

- Identify key climate change issue for community
- Brainstorm investigation and stewardship ideas

Design and implement stewardship project to help community address the climate change issue.
Design Elements

**Social-Ecological Resilience**

- Data collection using GLOBE protocols – local problem, global data
- Explicit expectation of a stewardship project

**Diversity**

- 3 generations of participation, team approach
- Key Project partner (Association of Interior Native Educators, Tribal Resilience Program)
- Intensive participant training on weaving indigenous culture and GLOBE
- Culturally-based curriculum supports

Ket’acik & Aapalluk Memorial School students, teacher Whitney Spiehler, elder and teacher Pauline Morris used GLOBE soil protocols to address erosion in Kwethluk, AK.
# Program Evaluation Insights

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<th>Learning goal</th>
<th>Change pre-post</th>
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<tr>
<td>Knowledge of local climate change issues</td>
<td>++</td>
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<tr>
<td>Knowledge of personal connection to climate change</td>
<td>+++</td>
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<tr>
<td>Knowledge of how to braid Alaska Native knowledge &amp; Western Science in a project</td>
<td>+++</td>
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<tr>
<td>Knowledge of connections and feedbacks between components of earth system</td>
<td>+</td>
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<tr>
<td>Confidence in designing an inquiry project</td>
<td>++</td>
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<tr>
<td>Knowledge of how to guide youth in investigating and addressing a climate change issue.</td>
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(Goldstream Group 2017)
Designing for outcomes across scales: Needs and priorities alignment

Ecological Research Question:
• How do shifts in climate affect the fate of ripe berries and timing of berry loss from plants in fall and winter across Alaska?

Local Question:
• Why are our berries changing?

Cit Sci Research Questions:
• Can the contributory model of citizen science be supplemented to increase diversity of participation and social-ecological resilience outcomes?
Designing for personal relationships and alternative learning frameworks

Winterberry - Arctic Harvest Study Design

Basic

Highly Supported

Highly Supported & Storytelling
Designing for diverse learners: Storytelling-based citizen science learning
Figure 2. Research framework for determining the impact of three Winterberry citizen science delivery methods (left) on learning outcomes at individual, programmatic and community scales that are expected to influence social-ecological system resilience (adapted from Jordan et al. 2012). Bolded individual and community outcomes are the focal response variables for our proposed research, and larger arrow size indicated larger hypothesized effect on these response variables.
Citizen Science Program Design

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Theoretical or generalizable needs → Local community needs

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  - Slower timescale

- **Individual learning,**
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(Bonney et al. 2015, Danielsen et al. 2009, Danielsen et al. 2010)
Thank You

**Alaska GLOBE**
**Collaborators:** E. Sparrow, K. Spellman, C Buffington, C. Keill, GLOBE Implementation Office at UCAR, Alaska School Districts, Alaska Schools,
**Funding:** NASA, NSF, Arctic and Earth SIGNs, Winterberry, Bonanza Creek LTER, Alaska EPSCoR, The International Arctic Research Center

**Winterberry**
**Collaborators:** K. Spellman, C. Mulder, E. Sparrow, J. Shaw, D. Cost, S. Stanley, C. Villano, L. Parkinson, C. Buffington, 409 citizen/community scientists
**Funding:** NSF Advancing Informal Science Learning

**Arctic and Earth SIGNs**
**Collaborators:** Elena Sparrow, Malinda Chase, K. Spellman, et al. University of Alaska Fairbanks; Association of Interior Native Educators; GLOBE Implementation Office; NASA Langley Research Center Office of Education; NASA Goddard Space Flight Center Cryosphere Branch; North Slope Borough School District and other school districts; Kenaitze Indian Tribe; 4-H Alaska; Santa Ana Community College MESA; Goldstream Group; NASA Science Mission Directorate STEM Activation Collective, 345 community/citizen scientists
**Funding:** NASA Science Mission Directorate
Marilyn Sigman

Alaska CoastWatch Project: Using Citizen Science to Engage Alaskan Youth in Strengthening Community Resilience

- Marine Education Specialist, UAF Alaska Sea Grant - Homer, Alaska
- Associate Professor, UAF
- Editor of a “best practices” handbook for Community-based monitoring of Alaska’s Coastal and ocean environments
Alaska CoastWatch for Action
Citizen Science Strategies to Engage Youth in Strengthening Community Resilience

Arctic Research Seminar
April 10, 2019

Marilyn Sigman
Community-Based Coastal Erosion Monitoring

“Stakes for Stakeholders” Bristol Bay Region

Providing Data for Storm Surge Modeling, Utqiagvik

HAB monitoring Kodiak and Bering Strait

PlateWatch Project, Unalaska
Overview: Encountering Environmental Hazards on Alaska's Coasts

Preparing for oil dispersant testing at Quayle Beach, Smith Island (Prince William Sound), after the Exxon Valdez oil spill in 1989. Public domain from the EVOS ARMS reference.

Climate change and other forces are altering the environment of Alaska’s coast and waterways. If you have encountered an unusual event on the coast, this site can help. It provides information on several issues Alaska coastal communities are facing, and what to do and whom to contact if you experience one of them.
Alaska Coastal Communities Want Their Youth Engaged in Community-Based Efforts

2014 Statewide “Best Practices” Workshop
K-12 Education Outcomes are Unique

The K-12 Education System

- **AK Dept. of Ed. School Administrators**
- **Students**
- **Teachers**
- **Standards**
  - ELA/Math/Cultural Standards

- **Science/STEM content**
  - Concepts
  - Practices/Skills
  - Critical Thinking

- **Proficiency:**
  - Good Grades & Test Scores
  - Graduation

- **Specific knowledge & skills**

- **Selection of science & natural resource careers**

- **Engaged Citizens**
2018 Regional Workshops:
Nome, King Salmon, Dutch Harbor, Dillingham
Alaska Communities Want Relevant and Timely Climate Change Education for Their Youth that isn’t Politicized or Scary
Focus of Alaska CoastWatch Project

- Community
  - Local governments & organizations involved in community resilience & adaptation planning
  - Tribal Environmental Specialists

- Environmental Educators
  - Emphasis on climate change and coastal hazard education

- Scientists
  - Assisting communities in collection of needed data for planning

- Project Partners
- K-12 Schools & After-School
- Teachers
- Youth
- Sea Grant

Project Partners
A Funding Source Provided the Coastal Hazard Focus
Educational Goals

• Connecting teachers and community educators to environmental hazard issues relevant to their students and their communities.

• Supporting them with the resources and tools to teach about the consequences of climate change and engage their students in making observations, collecting data, and problem-solving.

• Ultimate goal of sustaining the educational approach in the school district curriculum and the community
An Educational Framework for Climate Change Education

- Receding Sea Ice
  - Greater shipping traffic
  - Increase risk of oil spills/pollution
- Thawing Permafrost
  - Better access to offshore oil and gas
  - Increased risk of oil spills/pollution
  - Loss of buffering to storm surge
  - Flooding
  - Erosion
  - Draining Lakes & Ponds
  - Potential release of methane
- Longer Growing Season
  - More tundra shrubs
  - Higher Risk of Tundra Wildfires
- Warmer Ocean Temperatures
  - Changes in marine biodiversity
  - Reduced abundance of subsistence foods

A WARMING CLIMATE
Based on the National Climate Assessment

Key Messages

• Arctic summer sea ice is receding (faster than expected) and is expected to virtually disappear before mid-century. This is altering marine ecosystems and leading to greater ship access (potential for pollution), offshore development (potential for oil spills) opportunity, and increased community vulnerability to coastal erosion.

• Permafrost temperatures in Alaska are rising, a thawing trend that is expected to continue, causing multiple vulnerabilities through drier landscapes, more wildfire, altered wildlife habitat, increased cost of maintaining infrastructure, and the release of heat-trapping gases that increase climate warming.

• Current and projected increases in Alaska’s ocean temperatures and changes in ocean chemistry are expected to alter the distribution and productivity of Alaska’s marine fisheries, which lead the U.S. in commercial value (and are the focus of subsistence harvests).

• The cumulative effects of climate change in Alaska strongly affect Native communities, which are highly vulnerable to these rapid changes but have a deep cultural history of adapting to change.

4 of 5 Key Messages for the Alaska Region in the 2018 National Climate Assessment.
Construct an explanation based on evidence how the availability of natural resources, occurrence of natural hazards, and changes to climate have influenced human activity.

**HS-ESS3-1** Examples of natural hazards can be from . . . severe weather (such as floods). Examples of the results of changes in climate that can affect populations or drive mass migrations include . . . regional patterns of temperature and precipitation.

**Conceptual Foundations**: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

**MS-ESS2-5** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

**3-LS4-4** Examples include changes in . . . temperature.

**Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.**

**3-ESS3-1** Examples: wind-resistant roofs.

**Ask questions to obtain information about the purpose of weather forecasting to prepare for, respond to severe weather.**

**K-ESS3-2**
Teacher Trainings
Support for Curriculum Development

Project-Based Learning

Monitoring Changing Weather Patterns

North Slope Science: Erosion Project

Connections to Culture, Citizen Science and CBM Efforts

Teacher Workshops With Community Experts
Making Educational Resources and Tools Available on AdaptAlaska.org

Visualize Change       Projects        Stories      Resources

What is Changing?       How Can We Adapt?
Opportunity to Share Teacher & Student Success Stories

High School Students
Erosion Monitoring Project
Goodnews Bay

Old Harbor 6th Grader
PSP Monitoring Project
Winner of two science fair awards
Michael Køie Poulsen

Enhancing Community-Based Observing Programs in the Arctic

- Biologist
- Nordic Foundation for Development and Ecology (NORDECO)
- Integrated Arctic Observation System (INTAROS)
Enhancing community-based observing programs in the Arctic

ARCUS and IASC seminar/webinar - Civic Participation in Arctic Research and Observing: Where We Are and Where We’re Going - 10 April 2019

Michael Køie Poulsen
NORDECO - INTAROS
mkp@nordeco.dk
Design | Observation | Interpretation | Action

**Scientist-executed**

**Citizen Science (Contributory)**

**Approaches with even more involvement of community members**

Focus Group Discussion (FGD) approach

- Qualitative research method.
- Documents Indigenous and local knowledge.
- Increases coverage
Piniakkanik Sumiiffinni Nalunaarsuineq
‘Opening Doors to Native Knowledge’
Local documentation and management of living resources
Natural Resource Council meeting

- Natural Resource Council
- Village Committee
- Local Authority
- Central Government

National decisions

Local authority decisions

Natural Resource Council meeting
<table>
<thead>
<tr>
<th>Name of coordinator:</th>
<th>Year, quarter:</th>
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<td>Community:</td>
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<tr>
<th>Species/impact</th>
<th>Month</th>
<th>Locality</th>
<th>Total number of</th>
<th>Catches in total</th>
<th>Undersized</th>
<th>Missed</th>
<th>Sold</th>
<th>Don't know</th>
</tr>
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</table>

Comments regarding number, size of hunted animals, first/last observed, etc.

Significance and possible explanation of trend*

Management recommendation (elaborate eventually on separate sheet)

Contributors:
Signature of coordinator

*Tendency compared to same period last year
- More sheets can be used if there are reports on more species/impacts
Example of PISUNA quarterly summary form. Expressing concern for Musk Ox at Lersletten. Stable but too small population. Could increase if illegal hunting is reduced. Recommends outsider’s help with law enforcement and change in license system.
PISUNA field activity through the year

Field trips

Month
Fishers proving that there are cods – Akunnaaq 2010
Atlantic Cod

Most PISUNA communities report regularly on Atlantic Cod.

Numbers increasing. Spreading northward.
Fishermen, hunters and other environmentally-interested people participate in a program of Greenland’s Government on the management of living resources. The program aims to establish locally-based documentation and resource management. It takes place in select villages and towns from Disko Bay and northwards in North West Greenland.

"After our hunting and fishing trips, we often discuss between us what we have seen. Some species are disappearing. Some species are coming back after having been away for a long time. And some species are turning up in larger numbers than before..."  
*Lars Olsen, Akunnaaq.*

"The extent of sea ice is rapidly changing. This has an impact on almost everything we do. During our hunting and fishing trips we see a lot of birds and seals and other resources. We write down what we see and we discuss what it means. We hope our records and knowledge can help the Government make wise decisions..."  
*Karl Tobiasen, Qaarsut.*
Search for Atlantic Cod

Observation Details

Total trips: 30
Quantity caught: 0
Trends: Increasing

Comment:
Increasing numbers are observed and most are of medium size. There are only few large individuals

Importance
Long lines for Atlantic Cod are now placed for no longer than one hour as there are so many Atlantic Cod

Suggested Action
We recommend that the Atlantic Cod surveys carried out up here in the north, also near Kangersuatsiaq, to also clarify the options here.
Some recommended sites:
www.pisuna.org
https://eloka-arctic.org/pisuna-net/
www.monitoringmatters.org
Situation today
Preliminary conclusions

- Citizen science is already undertaken but large unexplored potential.
- Geo-physical, biological, environmental, cultural topics.
- Immediate feedback needed.
- Builds trust between scientists and people.
- Broad interest in further cooperation, incl. pilot program in 2019.
- Next step: Test existing c.5 CS initiatives. Evaluate.
What have we learned?
Time from data gathering to management decision
Communities should not only gather data for researchers

Community-based monitoring should also:

• Make sure that communication reaches decision-makers and leads to management action.

• Provide users a ‘voice’. Express how they see the challenges and solutions.

• Raise environmental awareness among users.
Ted Cheeseman

Creating Polar Ambassadors through Citizen Science

- Senior polar expedition guide, Polar Citizen Science Collective
- Co-founder of Happywhale, a marine mammal photo ID citizen science web platform
Creating polar ambassadors through citizen science
Cloud Observations & Seabird Surveys
Phytoplankton Sampling
Happywhale: Tracking the Whales of the Southern Ocean

Feedback delivered to contributor

Voyage tracks with geolocated encounters
Happywhale: Automated Image Recognition of Individual Whale ID

Computer vision enabling powerful citizen science
Happywhale: Tracking the Whales of the Southern Ocean

Feedback delivered to contributor

Voyage tracks with geolocated encounters
IAATO is supporting Science

Travelling to Antarctica on board an IAATO vessel gives us the opportunity to participate in citizen science and to contribute valuable information to the scientific community for a better understanding and protection of the Southern Ocean and Antarctica.

What is citizen science and why should we participate?

Citizen science is scientific research conducted in part by non-professional scientists. It is a way to utilize the power of thousands of travelers around the globe to observe, record, and report on natural phenomena. This is particularly important in remote and difficult-to-access locations, like the Southern Ocean and Antarctica. Research in these areas is expensive and requires extensive resources. Citizen science allows volunteers to contribute valuable knowledge to the scientific community with limited resources.

By participating in citizen science programs and projects, volunteers can help scientists gain a better understanding of the region, which will help to protect the environment. Volunteers can also help to increase public knowledge and interest in the region. Citizen science projects also allow volunteers to personally contribute to scientific research, fostering a greater understanding of the natural world.

How to make citizen science successful on board

Citizen science works well when it is considered as an activity in the same way as kayaking or camping and incorporated into the company’s program. It is recommended to assign one expedition staff member to act as “Citizen Science Coordinator/Citizen Science Navigator” for each cruise. Higher priority would be given to:

- Oversee and coordinate the citizen science program;
- To discuss the project scheduling with the Expedition Leader;
- Assign “Project Leads” to the individual citizen science projects;
- Ensure data collection protocols are met and data are delivered to respective scientific partners; and
- Serve as the go-to expedition staff member for guests interested in participating.

Here are a few tips on how to make citizen science successful during your voyage:

- Consider an introductory power point presentation to introduce the citizen science program you offer on board (many projects listed below provide power point material).
- Consider creating a citizen science voyage plan; some projects are excellent for sea days, others for in the field; some are site specific, and some can be done throughout the entire voyage.
- Create a citizen science notice board, where you post information/photographs about each project (additionally other relevant information from the scientific community).
- Post citizen science activities in the daily program.
- Mention citizen science activities/findings at the daily recap.
- Invite guests to an end of trip citizen science recap where you summarize the projects you are doing on the trip, show preliminary results, and discuss the concept of being an Antarctic Ambassador.
- Include citizen science information in the post-trip information package that guests receive, such as information about the projects you offered including important project websites, or about science projects guests can participate in when back at home (e.g. www.penguinswatch.org).

Project overview

In the following you will find a brief description of the various projects supported by IAATO and the Polar Citizen Science Collective. For detailed information about each project please refer to the downloadable resources provided via IAATO (specific links are mentioned in each project description).

HAPPY Whales – Marine Mammal Photo Identification

*Background*

Happywhale is a Storybase/StoryMap platform that registers new marine mammal sightings from citizen scientists from all over the world, serving the research community as a data source for photo identification (photID) studies of marine mammals. This citizen science program was created by scientists, where unique individually identifiable species can be documented and images can be used to analysing population trends. Photographs of marine mammals can be contributed to the storyMap which will then be displayed on the website. The project is a collaboration between scientists, guests and the IAATO expedition staff. Photographs registered on the storyMap will be used to identify and track individual marine mammals, such as whales, dolphins and seals. Scientists will playback registered images to determine the location and tag of the image. Future plans for the project include a mobile application, creating awareness and inspiring others to identify and document marine mammals. This project is a joint undertaking between IAATO, the Polar Citizen Science Collective and Happywhale.

*How to participate*:

- Make sure your camera has the Happywhale app. If not, follow the instructions in the app.
- Make sure you identify the species of the marine mammal in the image.
- Save your image to the Happywhale app.
- Tag the location of the marine mammal in the storyMap.

*Expected results and feedback*:

- Scientists will use the images to track marine mammals and create awareness.
- The general public can follow the trends on the storyMap.

*Scientific project partners*

Data shared with a wide collaboration of research groups, depending on species. A major goal of Happywhale is to create awareness and inspire others to identify and track individual marine mammals.

*Citizenship partners*

- Polar Citizen Science Collective
- IAATO

*Antarctic Killer Whale Photo Catalog*

The Antarctic Peninsula may be home to the southernmost population of the species, however, this has never been confirmed. SpecialPhoto of the dorsal fin and saddle patch (the latter is used to identify individuals) will be obtained, along with the date and location of the sighting to stimulate scientific interest. Irrespective of the killer whale’s taxonomic status, the project will be of great conservation interest. The project will be of great conservation interest.

*Scientific project partners*

Data shared with a wide collaboration of research groups, depending on species. A major goal of Happywhale is to create awareness and inspire others to identify and track individual marine mammals.

*Citizenship partners*

- Polar Citizen Science Collective
- IAATO

*Scientific project partners*

Antarctic Humpback Whale Catalog

Fur seals and whales are the primary prey of killer whales in the Southern Ocean. The project will focus on obtaining high-quality photo identification data of humpback whales (Megaptera novaeangliae) to aid in the study of their migratory patterns and population sizes. Scientists will analyze the data to determine the movement patterns and population size of humpback whales in the Southern Ocean. The project will aid in understanding the impact of climate change on marine mammals.

*Scientific project partners*

- Polar Citizen Science Collective
- IAATO

*Scientific project partners*

WHALE SWIM Project - Southern Right Whales in Southern Right Whales were one of the last whale hunted in the Southern Ocean which led to their recovery. Photos of the dorsal fin of Southern Right Whales are taken regularly after the Southern Ocean commercial whaling. Photos of the dorsal fin are used to study the population dynamics and migration patterns. The research project undertaken by members of the team is a joint undertaking between IAATO, the Polar Citizen Science Collective and Happywhale.

*Scientific project partners*

- Polar Citizen Science Collective
- IAATO

*Scientific project partners*

WE NEED YOUR HELP

Please look out for right whales on your travel this season!

*Scientific project partners*

- Polar Citizen Science Collective
- IAATO

*Scientific project partners*
In Development: Polar Collective Mobile App for Citizen Science

The Polar Citizen Science Collective currently operates 8 projects that will be implemented into the app using common modular building blocks. This programming efficiency dramatically reduces development time and cost, and invites perpetual scalability.

### Roadmap and Timeline

The roadmap and timeline for the development of the Polar Collective Mobile App for Citizen Science are as follows:

**January**
- User Research
- App Design

**February**
- Build MVP App using Happywhale as pilot science project

**March**
- Recruit Dev
- Setup Tracking

**April**
- Build MVP App with Happywhale + Project Set A

**May**
- Launch App for Arctic Summer Season

**June**
- Test/Track app usage
- Build Project Content Management Backend for Content Developers

**July**
- Launch App for Antarctic Summer Season with Happywhale + Project Set B

**August**
- Continue App Maintenance and make any necessary changes for any new projects.

**September**
- Outreach to Arctic Tour Operators

**October**
- Scientist outreach for Project Set A

**November**
- Scientist outreach for Project Set B

**December**
- Outreach to Antarctic Tour Operators

*Note: Project Set A is 2-3 of the projects from the full list of 8. Project Set B is 2-3 more projects from this list.*
Thank You!
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Thank You!

- The next Arctic Research Seminar will be:
  - 3 May 2019, 8:00-9:00 a.m. AKDT (12:00 p.m. EDT) in Washington, D.C.
    featuring Larry Hamilton (UNH): *What People Know – Asking About the Arctic on US General-Public Surveys*

- Please visit ARCUS online to find:
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