A citizen science project in Svalbard

Why and how – mind the gap!

Børge Damsgård

Professor marine ecology, HoD Arctic Biology, Vice Dean Research

The Longyearbyen mouse traps example

MUSEDEPONI: Musefangerutstyr er tilgjengelig for den som vil jakte på mus. Fangeskassene er plassert under lyktestolpen bak Museet i Forskningsparken. FOTO: RUPERT KRAPP

Lokker med gratis musefeller og premier

Eva Fuglei, Norsk Polarinstitutt, Paul Lutnæs, Sysselmannen på Svalbard, Rolf A. Ims, UiT Norges arktiske universitet.

Ikke alle får anledning til å fangste fjellrev på Svalbard fordi det er mange søkere i forhold til antall fangstområder. Har du likevel en drøm om å drive fangst med musefangere på Svalbard? Vi trenger nemlig musefangere på Svalbard. Alle kan fange østmarkmus, om du er mann eller kvinne, voksen eller barn. Det eneste du trenger å lære deg er hvordan musefellen settes opp, hvor den bør plasseres og hvilket ute som er best, og ripps så er du fangstmann/kvinne. Premier deles også ut!

Østmarkmus – en blindpassasjer fra øst

På denne tiden av året er det ikke uvanlig å se mus og musespor i snøen i Longyearbyen og noen har allerede mottatt feller for å få musene bort fra husene sine.

Musene det er snakk om er østmarkmus som kom som blindpassasjerer med båter fra Russland til Grumantbyen i forbindelse med kulldriften der en gang på 1900-tallet. Menneskene forlot Grumant på 1960-tallet, men østmarkmusene ble værende igjen og overlevde i de frodige bakkene under Fuglefjella mellom Grumant og Bjørndalen som lenge har vært et kjerneområde for denne fremmede arten for Svalbard. I gode musår har de også forekommet ganske tallrikt vestover til Colesbay.

Musene sprer seg

Om vinteren er musene veldig negativt påvirket av is på bakken. Så i år med mye is går bestandene kraftig tilbake, for å øke igjen i vintre med lite eller ingen is på bakken. Det nye nå er at musene utbredelsesområde seg utenfor sitt normale utbredelsesområde langs Isfjorden. I 2017 ble mus og musespor funnet på Hatten, Diabas og Vindodden samt i Barentsburg.

I 2018 starter derfor et prosjekt finansiert av Svalbards Miljøvernfond for å dokumentere spredningen av østmarkmus til nye områder. Spredningen skyldes sannsynligvis den senere tids betydelige klimaoppvarming på Svalbard.

Fremmed og uønsket art

Som en fremmed, innført art er østmarkmusa uønsket på Svalbard. Lenge var den ansett som en begrenset kuriositet, uten noen større effekter på hverken natur eller folk. Men i 1999 ble det oppdaget en bendelorm i musene (EM-parasitten).

Musa er vert for et larvestadium av EM-parasitten som danner store cyster i musa leveren. Hvis musa spises av en fjellrev eller en hund utvikles parasittens larvestadium til voksne bendelorm i reve- eller hundetarmen. Tusenvis av parasittegg kommer så ut med avføringen til de infiserte revene eller hundene. Eggene må så spises av mus for at musene skal bli smittet og parasittens livssyklus skal bli fullført. EM-parasitten kan være farlig for oss mennesker dersom vi får i oss eggene ved å komme i kontakt med avføring fra infiserte fjellrev eller hunder.

Everyone in town can pick up mouse traps outside UNIS, catch mouses in town and deliver the dead ones in the boxes

"Lures with free mouse trap and prizes"

Svalbardposten, Nov. 2018

Discuss with the person next to you

1. What are the downside and upsides for researcher?

2. What are the downside and upsides for the people participating?

2-3 minutes from NOW!

SWOT-analysis

	Positive factors	Negative factors
Internal	Strength:	Weakness:
External	Possibilities:	Threats:

But, what is ”citizen science”

Also called:
Community science
Crowd science
Civic science
Volunteer monitoring
Network science

- “~~Use of citizens in research tasks~~”
- “Science done by ordinary people, for or with scientists”
- “Engagement of non-professionals in conducting scientific research in collaboration with professional scientists”

… and what does it mean?

Any citizen?	Motivation?
	Skills?
	Age?
	Pro-training abilities?
Any science?	Topics?
	Methods?
	Equipment?
	Safety and ethical issues?
Any scientist?	Govermental, NGO, private?
	Competance in citizen science?

Citizen science has become a «buzzword»

Possible prerequsites

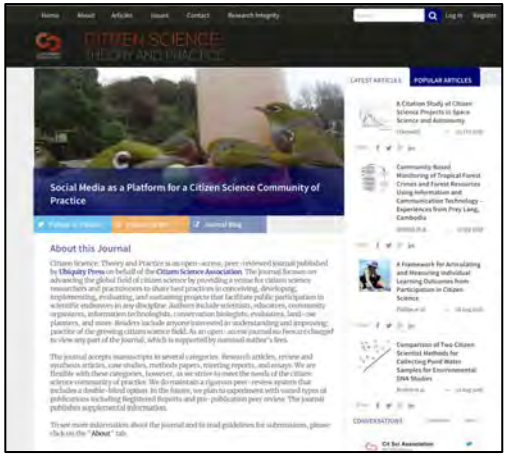
Citizen science projects must:

1. Be coordinated by a research institution
2. Use citizens with the appropriate background
3. Address topics where citizens can give valuable contribution
4. Use methods that are safe and scientifical & ethical sound
5. Link the project with a learning or dissemination aspect

If not, it is a project, not a citizen science project

Citizen science is a research field on its own

A society



A journal

An annual meeting

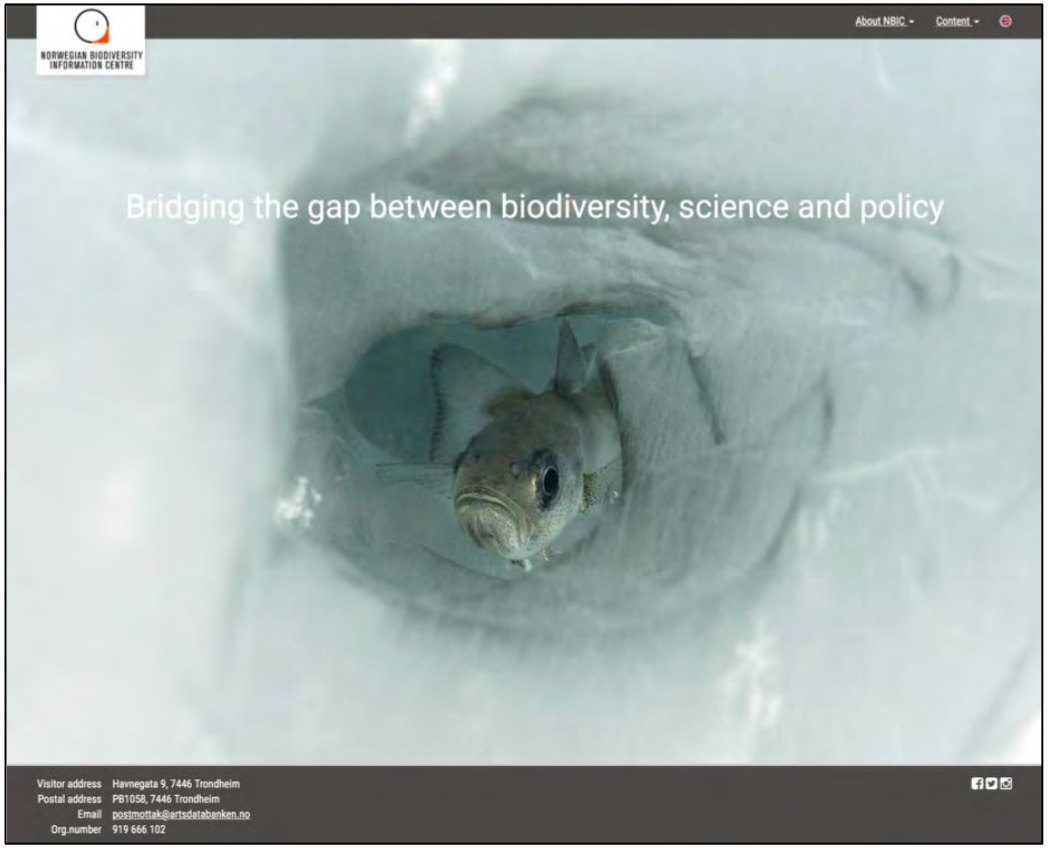
Core types of citizen science projects

- Data collection
- Research participation
- Opinions

Typical examples of data collection

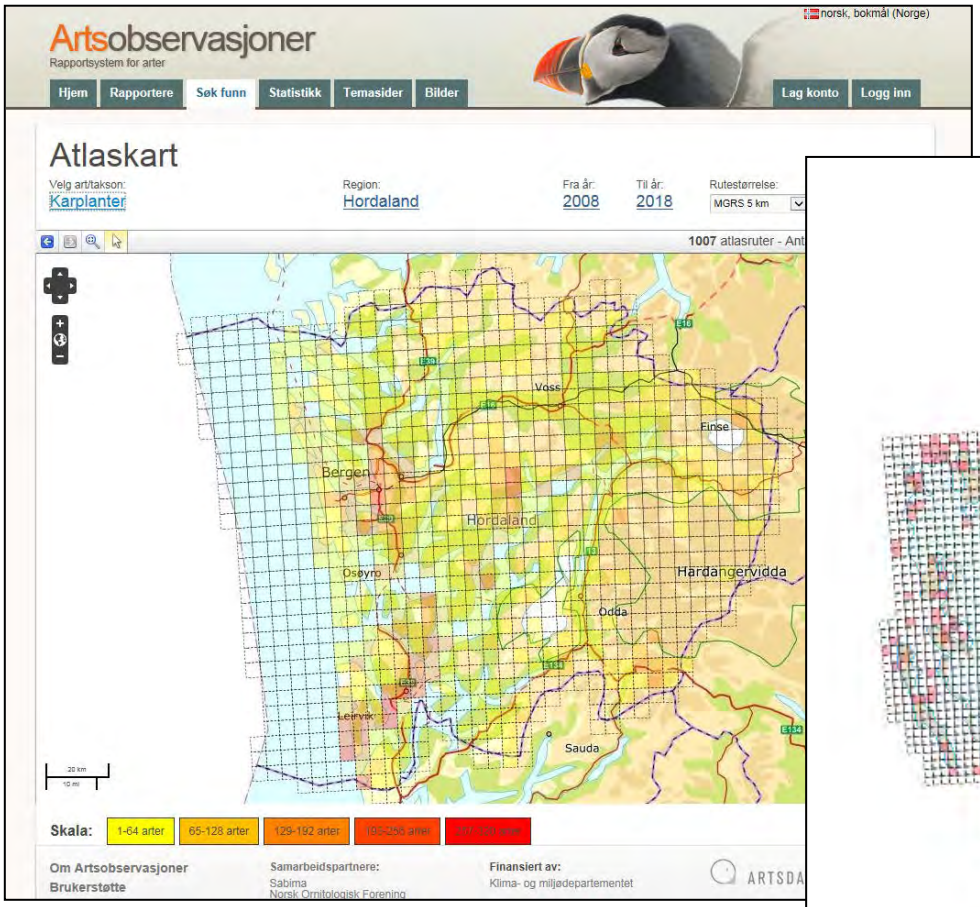
Example 1: Ask anyone to send in data, of e.g.

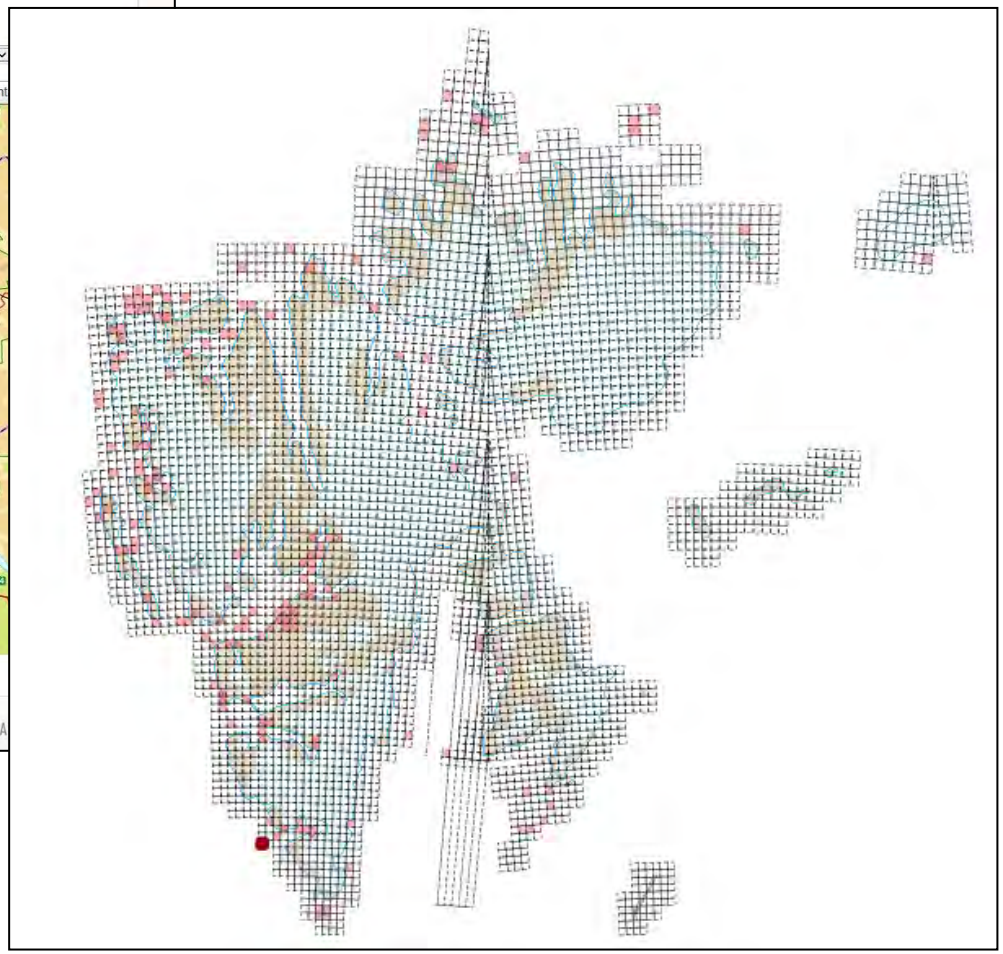
- A specific animal or plant
- All animals at a specific place (feeding site)
- First time they see an animal in the season



Trait:
Low threshold
for participation

Grid-observation system

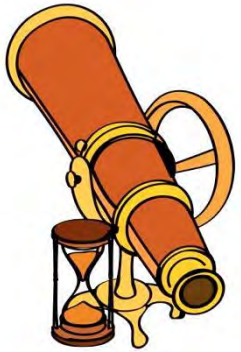




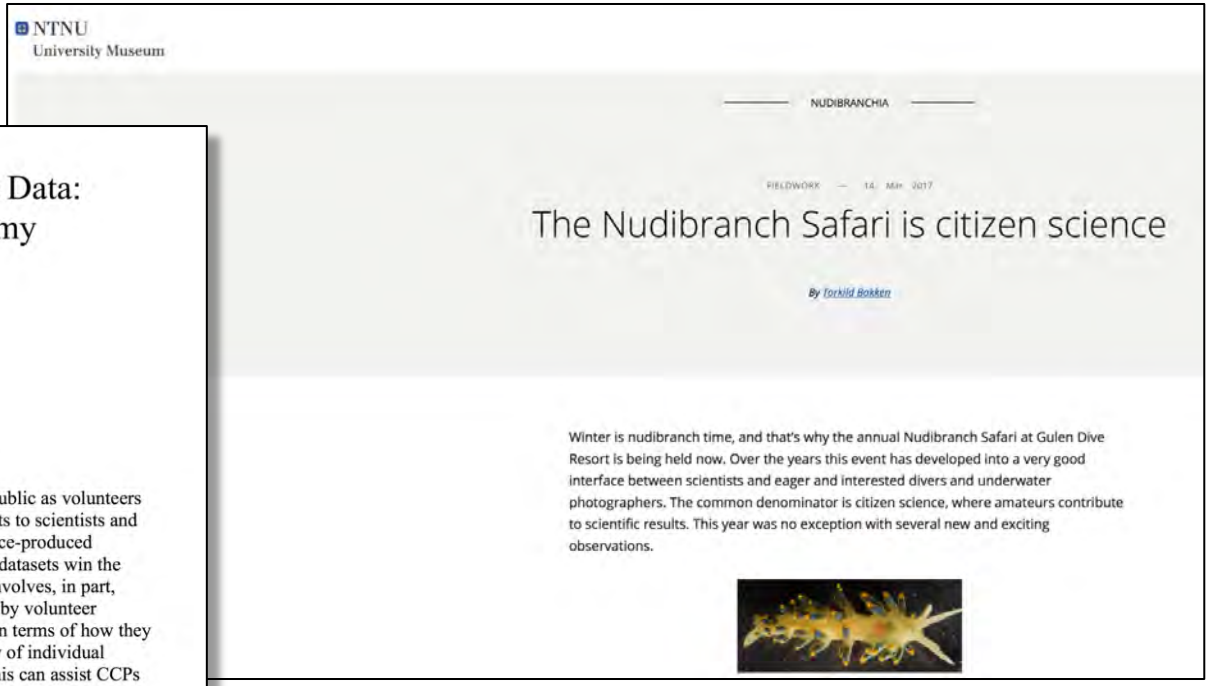
Need to know <u>what</u> you observe and <u>where</u> you are

www.artsobservasjoner.no

Example 2: Ask a specific group to send in data, e.g.



- Divers
- Ornithologist Facebook group
- Astronomist club
- A school class


NTNU
University Museum

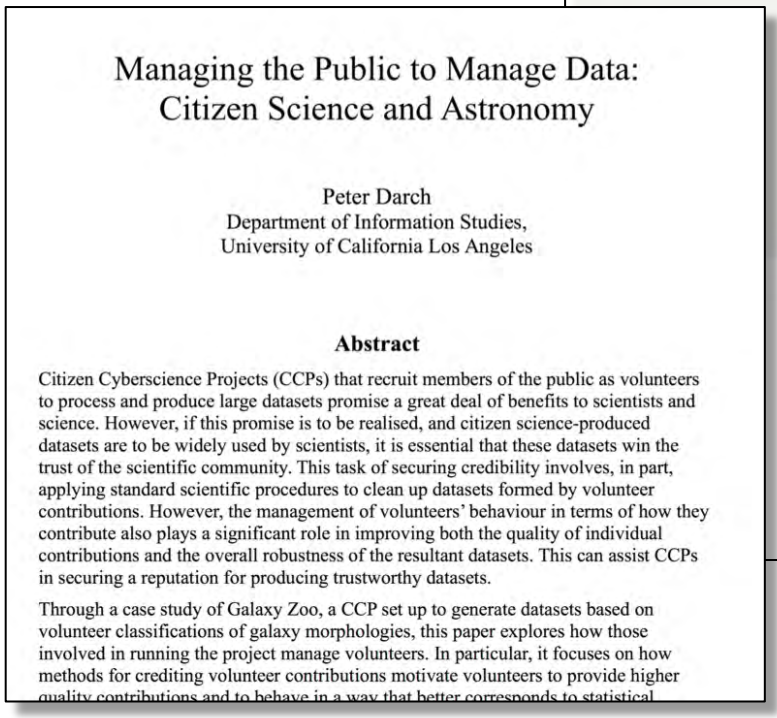
NUDIBRANCHIA

FIELDWORK — 14. Mär 2017

The Nudibranch Safari is citizen science

By Torkild Bakken

Winter is nudibranch time, and that's why the annual Nudibranch Safari at Gulen Dive Resort is being held now. Over the years this event has developed into a very good interface between scientists and eager and interested divers and underwater photographers. The common denominator is citizen science, where amateurs contribute to scientific results. This year was no exception with several new and exciting observations.


Managing the Public to Manage Data:
Citizen Science and Astronomy

Peter Darch
Department of Information Studies,
University of California Los Angeles

Abstract

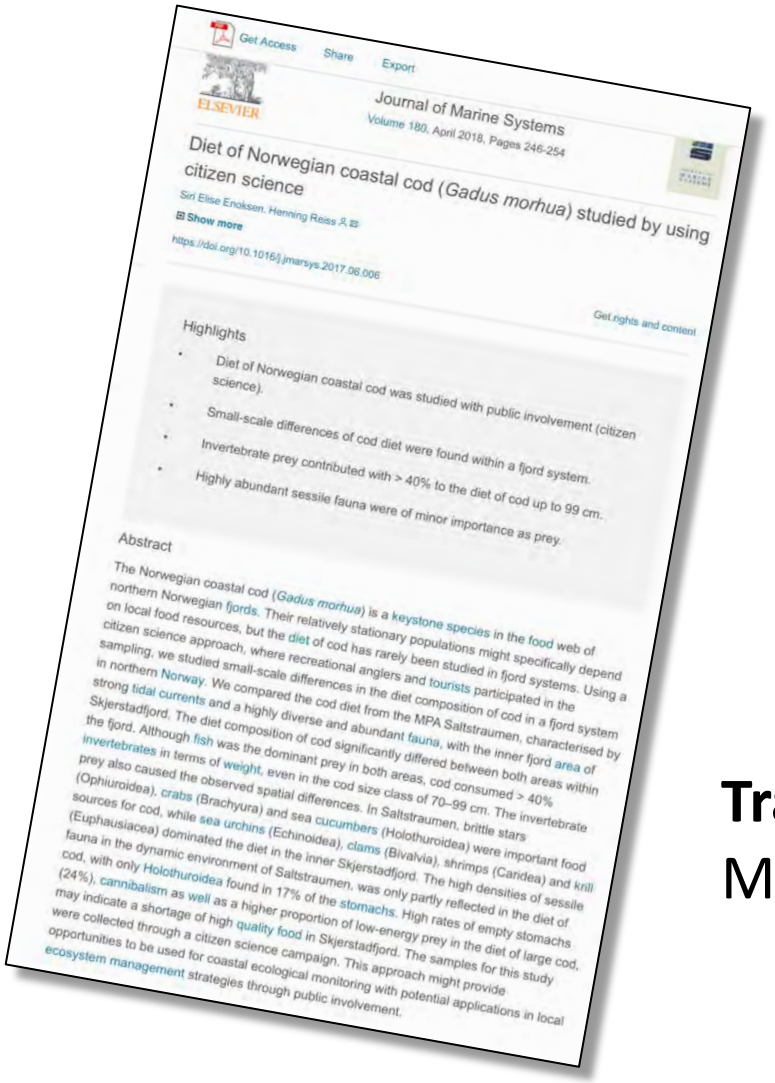
Citizen Cyberscience Projects (CCPs) that recruit members of the public as volunteers to process and produce large datasets promise a great deal of benefits to scientists and science. However, if this promise is to be realised, and citizen science-produced datasets are to be widely used by scientists, it is essential that these datasets win the trust of the scientific community. This task of securing credibility involves, in part, applying standard scientific procedures to clean up datasets formed by volunteer contributions. However, the management of volunteers' behaviour in terms of how they contribute also plays a significant role in improving both the quality of individual contributions and the overall robustness of the resultant datasets. This can assist CCPs in securing a reputation for producing trustworthy datasets.

Through a case study of Galaxy Zoo, a CCP set up to generate datasets based on volunteer classifications of galaxy morphologies, this paper explores how those involved in running the project manage volunteers. In particular, it focuses on how methods for crediting volunteer contributions motivate volunteers to provide higher quality contributions and to behave in a way that better corresponds to statistical

Trait:

More knowledge about the participants

Exampel 3:
Collect data after other citizen activities



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ELSEVIER

Journal of Marine Systems
Volume 180, April 2018, Pages 246-254

Diet of Norwegian coastal cod (*Gadus morhua*) studied by using citizen science

Siri Elise Enoksen, Henning Reiss

Show more

https://doi.org/10.1016/j.jmarsys.2017.06.006

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Highlights

- Diet of Norwegian coastal cod was studied with public involvement (citizen science).
- Small-scale differences of cod diet were found within a fjord system.
- Invertebrate prey contributed with > 40% to the diet of cod up to 99 cm.
- Highly abundant sessile fauna were of minor importance as prey.

Abstract

The Norwegian coastal cod (*Gadus morhua*) is a keystone species in the food web of northern Norwegian fjords. Their relatively stationary populations might specifically depend on local food resources, but the diet of cod has rarely been studied in fjord systems. Using a citizen science approach, where recreational anglers and tourists participated in the sampling, we studied small-scale differences in the diet composition of cod in a fjord system in northern Norway. We compared the cod diet from the MPA Saltstraumen, characterised by strong tidal currents and a highly diverse and abundant fauna, with the inner fjord area of Skjerstadfjord. The diet composition of cod significantly differed between both areas within the fjord. Although fish was the dominant prey in both areas, cod consumed > 40% invertebrates in terms of weight, even in the cod size class of 70–99 cm. The invertebrate prey also caused the observed spatial differences. In Saltstraumen, brittle stars (Ophiuroidea), crabs (Brachyura) and sea cucumbers (Holothuroidea) were important food sources for cod, while sea urchins (Echinoidea), clams (Bivalvia), shrimps (Caridea) and krill (Euphausiacea) dominated the diet in the inner Skjerstadfjord. The high densities of sessile fauna in the dynamic environment of Saltstraumen, was only partly reflected in the diet of cod, with only Holothuroidea found in 17% of the stomachs. High rates of empty stomachs (24%), cannibalism as well as a higher proportion of low-energy prey in the diet of large cod, may indicate a shortage of high quality food in Skjerstadfjord. The samples for this study were collected through a citizen science campaign. This approach might provide opportunities to be used for coastal ecological monitoring with potential applications in local ecosystem management strategies through public involvement.

Collection of fish stomages after tourist fishing

Trait:
More knowledge about the method

Photo: Nofima

Research participation

- Research volunteer programs
- Citizens join regular field work
- Scientists join other citizen activities
    - School classes
    - Tourist activities

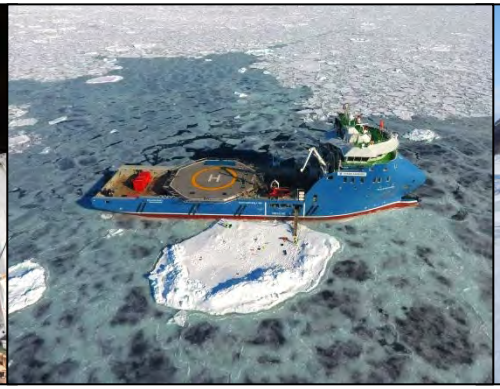



Photo: Børge Damsgård/Sebastian Sikora/ Heidi Sevester/Anne Hormes

Exampel 4:

Cruise#Science

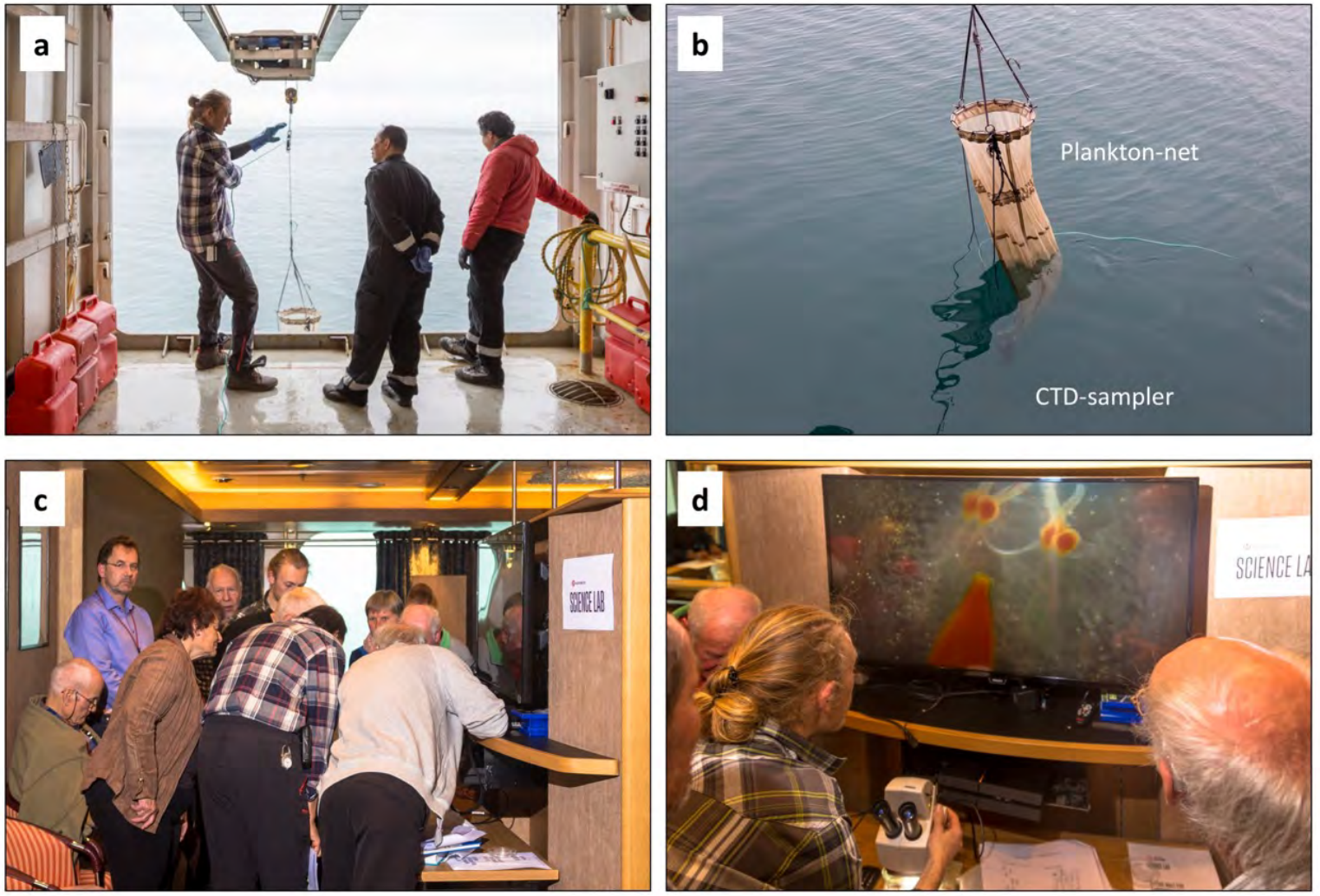


Photo: Børge Damsgård

Objectives from the proposal

… to develop dissemination and sampling at the Hurtigruten expedition ships, specifically regarding:

- Develop methods and equipment for a marine citizen science project
- Establish time series for marine biological sampling on the east cost of Svalbard
- Evaluate practical adjustments for demonstration and tourist sampling, including safety aspects and environmental effects

Photo: Stefan Dall

Outputs from the trips

- Scientific output
  - Plankton samples
  - CTD data
  - Nutrient
  - DNA
  - Chl a
  - Community
  - Polar bear observation
- Student samplings
- Tourist activities
  - Demonstrations
  - Lectures

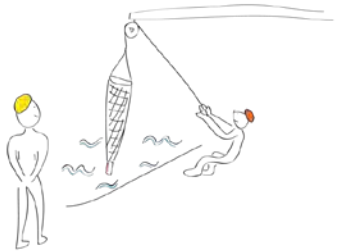
Totally 36 stations, >400 samples, >40 demonstrations, 8 lectures

What do the guests get out of it?

1 Theoretical background

2 Dry equipment demonstration

3 Wet equipment demonstration



4 Species identification

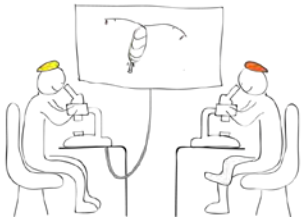
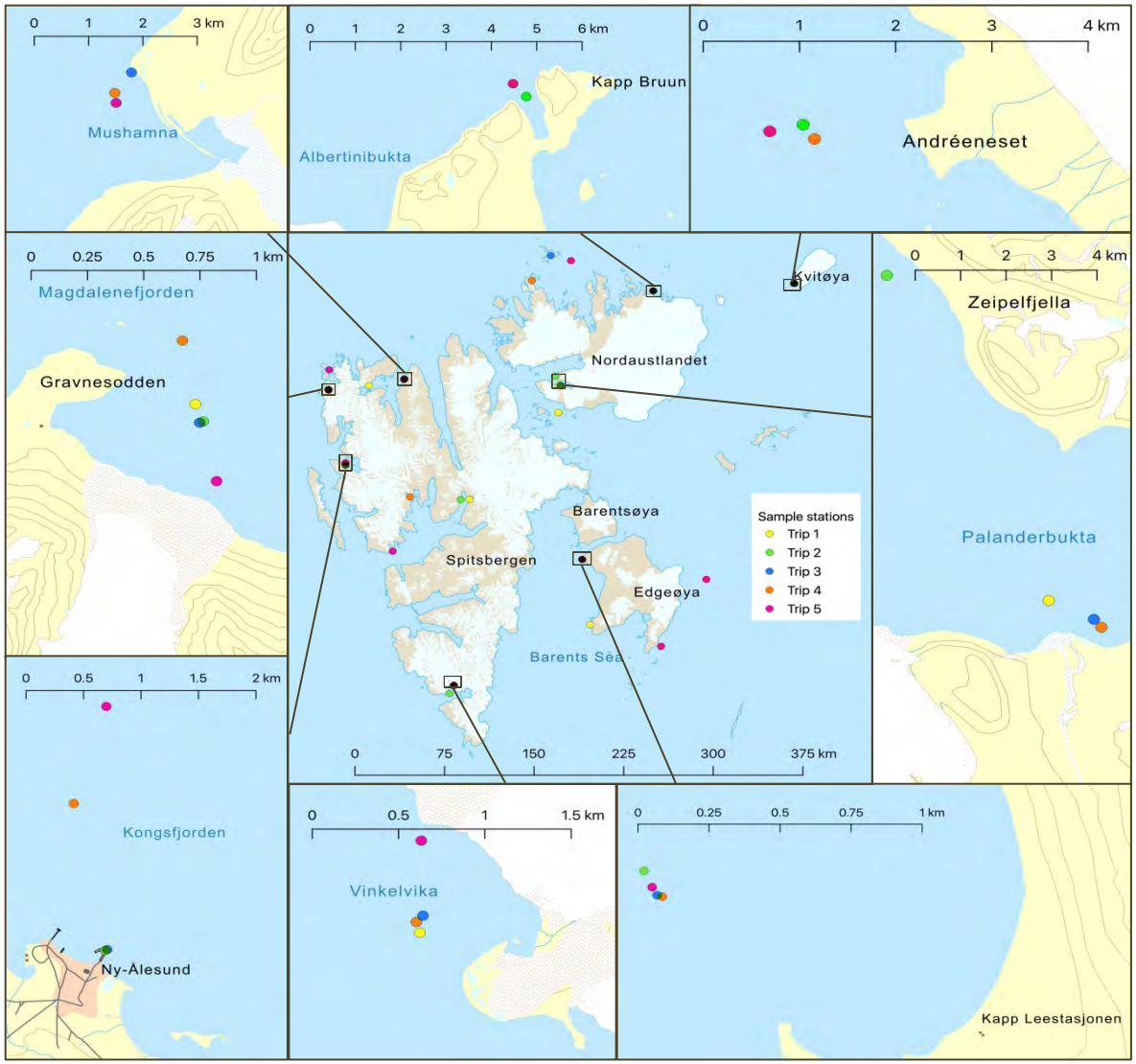
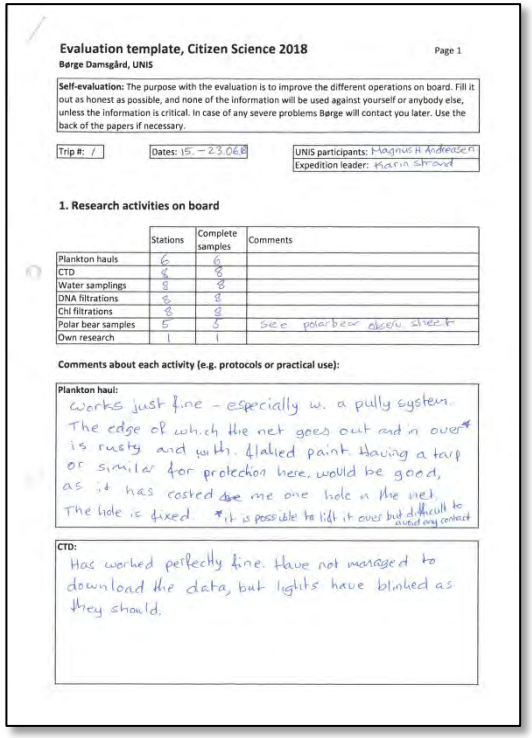


Photo: Børge Damsgård, illustration: Magnus H. Andreasen

Station and sampling points



Evaluation of the trips



Evaluation template, Citizen Science 2018 Page 1

Børge Damsgård, UNIS

Self-evaluation: The purpose with the evaluation is to improve the different operations on board. Fill it out as honest as possible, and none of the information will be used against yourself or anybody else, unless the information is critical. In case of any severe problems Børge will contact you later. Use the back of the papers if necessary.

Trip #: 1 | Dates: 15.–23.06.18 | UNIS participants: Magnus H Andreasen | Expedition leader: Karin Strand

1. Research activities on board

	Stations	Complete samples	Comments
Plankton hauls	6	6	
CTD	8	8	
Water samplings	8	8	
DNA filtrations	8	8	
Chl filtrations	8	8	
Polar bear samples	5	5	see polarbear observ sheet
Own research	1	1	

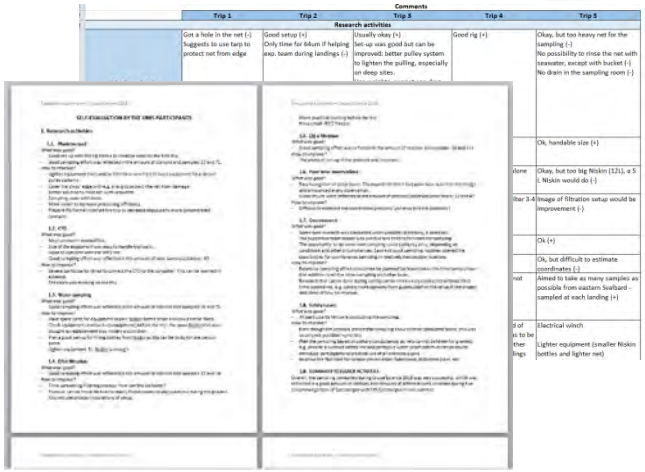
Comments about each activity (e.g. protocols or practical use):

Plankton haul:
Works just fine – especially w. a pully system. The edge of which the net goes out and in over is rusty and with flaking paint. Having a tarp or similar for protection here, would be good, as it has rasted the one hole in the net. The hole is fixed. *It is possible to lift it over but difficult to avoid any contact

CTD:
Has worked perfectly fine. Have not managed to download the data, but lights have blinked as they should.

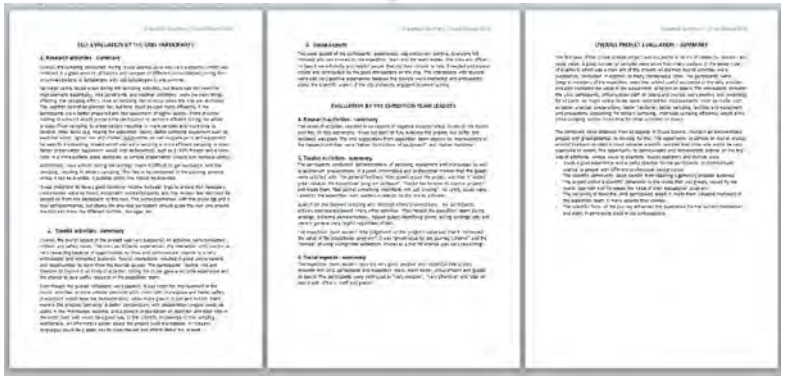
Self-evaluation

Evaluation from cruise leader

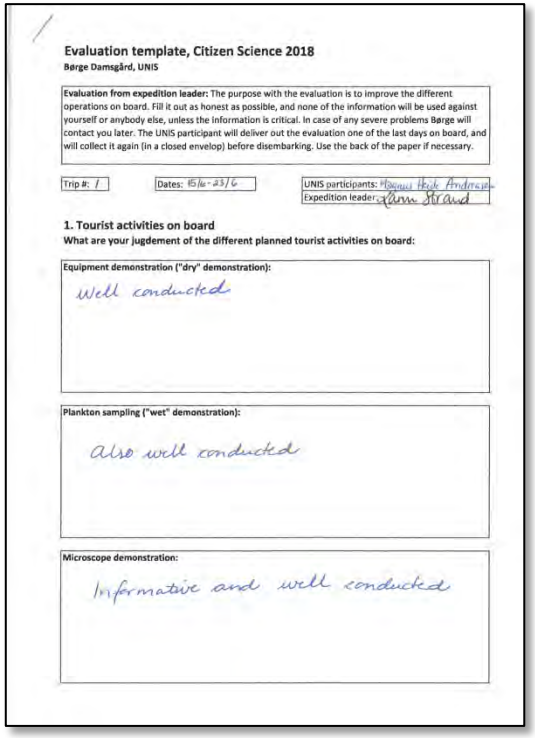


Comments

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5
Research activities					
	Got a hole in the net (-) Suggests to use tarp to protect net from edge	Good setup (+) Only time for 64um if helping exp. team during landings (-)	Usually okay (+) Set-up was good but can be improved; better pulley system to tighten the pulling, especially on deep sites.	Good rig (+)	Okay, but too heavy net for the sampling (-) No possibility to rinse the net with seawater, except with bucket (-) No drain in the sampling room (-)
					Ok, handable size (+)
				lone	Okay, but too big Niskin (12L), a 5 L Niskin would do (-)
				ter 3-4	Image of filtration setup would be improvement (-)
					Ok (+)
					Ok, but difficult to estimate coordinates (-)
				not	Aimed to take as many samples as possible from eastern Svalbard - sampled at each landing (+)
				d of s to be ther ings	Electrical winch Lighter equipment (smaller Niskin bottles and lighter net)



Evaluation summary



Evaluation template, Citizen Science 2018

Børge Damsgård, UNIS

Evaluation from expedition leader: The purpose with the evaluation is to improve the different operations on board. Fill it out as honest as possible, and none of the information will be used against yourself or anybody else, unless the information is critical. In case of any severe problems Børge will contact you later. The UNIS participant will deliver out the evaluation one of the last days on board, and will collect it again (in a closed envelop) before disembarking. Use the back of the paper if necessary.

Trip #: 1 | Dates: 15/6–23/6 | UNIS participants: Magnus Holt Andreasen | Expedition leader: Karin Strand

1. Tourist activities on board

What are your judgement of the different planned tourist activities on board:

Equipment demonstration ("dry" demonstration):
Well conducted

Plankton sampling ("wet" demonstration):
Also well conducted

Microscope demonstration:
Informative and well conducted

Overall evaluation

“added great value to the educational program on board”

“linked the lectures to science projects”

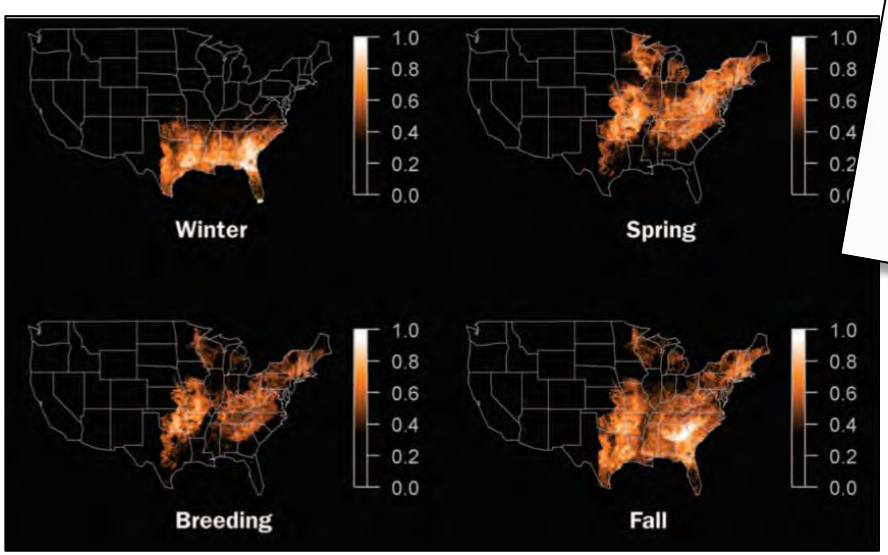
“feel part of something important, not just cruising”

Photo: Stefan Dall

What do we know about scientific upsides?

We can do something we cannot achieve

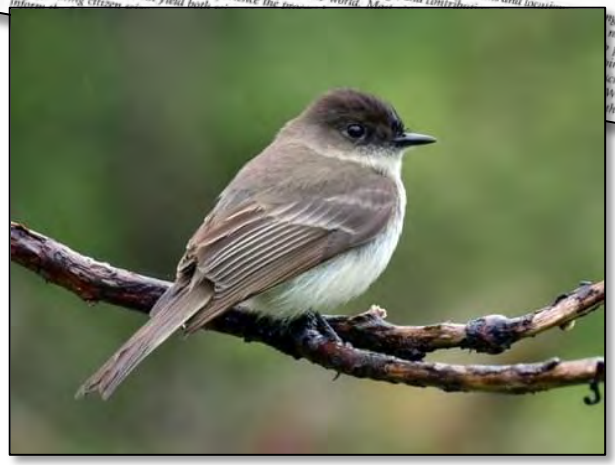
- Large sample number at the same time
- Samples in a large area
- Long time series of samples



Seasonal distribution of eastern phoebe using eBird citizen science

Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy

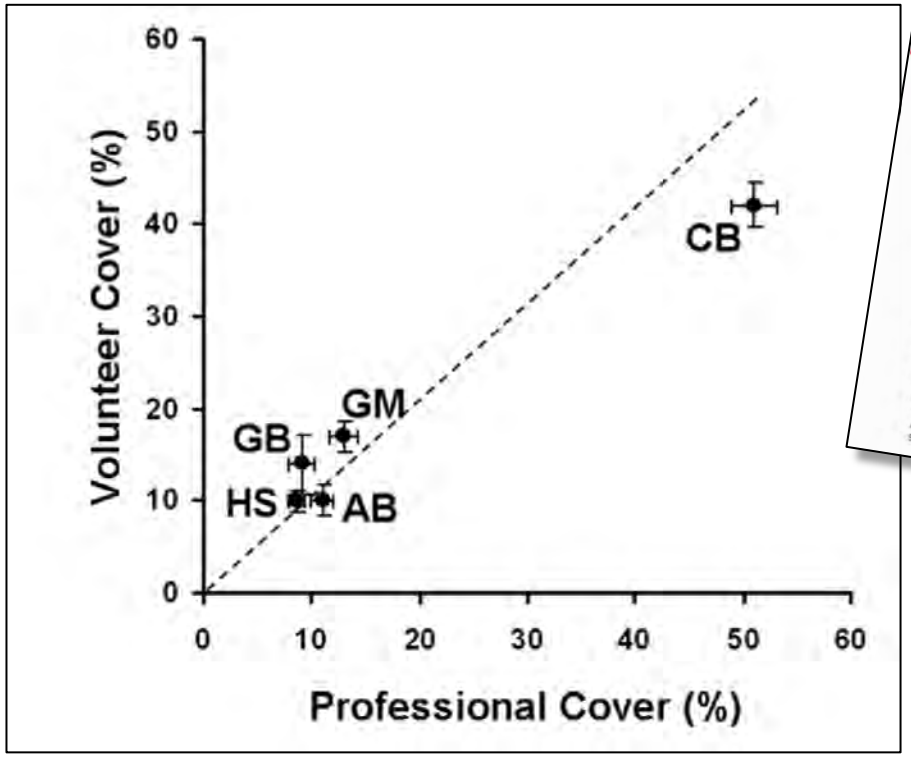
RICK BONNEY, CAREN B. COOPER, JANIS DICKINSON, STEVE KELLING, TINA PHILLIPS, KENNETH V. ROSENBERG, AND JENNIFER SHIRK



Bonney et al., 2009

What do we know about scientific downsides?

- Are the data representative?
- Can we trust the outputs?
- What does the quality depend upon?
- How important is training before collection?




LETTER

Assessing citizen science data quality: an invasive species case study

Alycia W. Crall[1], Gregory J. Newman[1], Thomas J. Stohlgren[2], Kirstin A. Holfelder[1], Jim Graham[1], & Donald M. Waller[3]

[1] Natural Resource Ecology Laboratory, Colorado State University, Campus Delivery 1499, Fort Collins, CO 80523, USA
[2] Fort Collins Science Center, US Geological Survey, 2150 Centre Avenue Bldg C, Fort Collins, CO 80526, USA
[3] Department of Botany, University of Wisconsin-Madison, 430 Lincoln Drive, Madison, WI 53706, USA

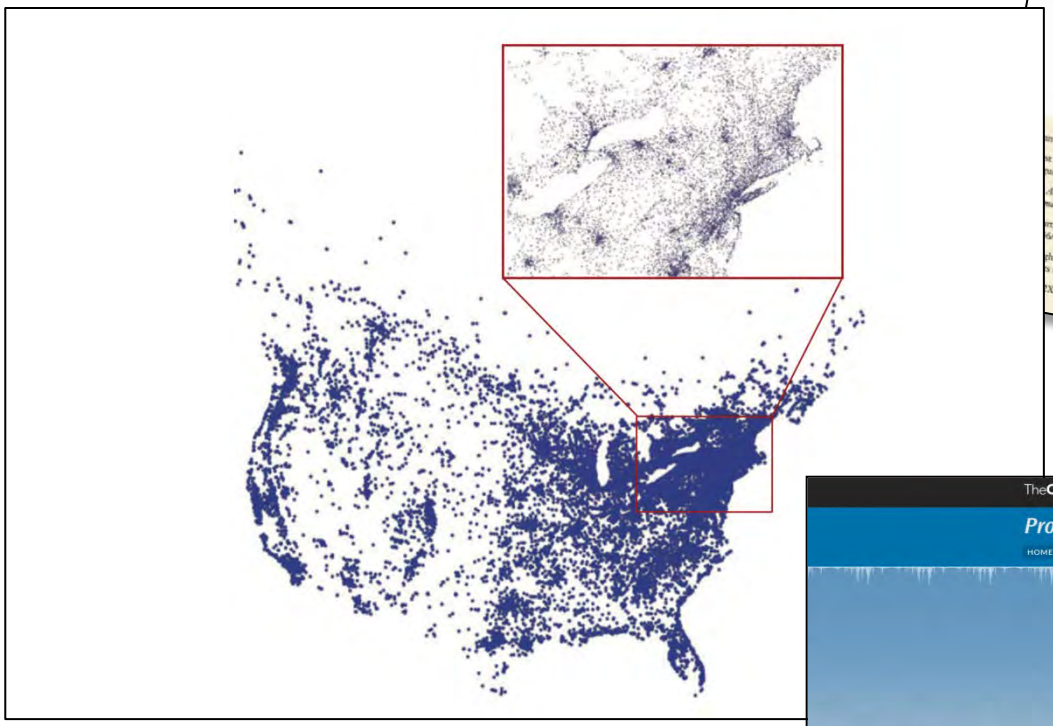
Keywords
Citizen science; data quality; invasive species; non-native species; vegetation monitoring; volunteer monitoring protocols.

Correspondence
Alycia W. Crall, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523-1499, USA. Tel: +(970) 491 2302; Fax: +(970) 491 1965. E-mail: Alycia.Crall@colostate.edu

Abstract
An increase in the number of citizen science programs has prompted an examination of their ability to provide data of sufficient quality. We tested the ability of volunteers relative to professionals in identifying invasive plant species, mapping their distributions, and estimating their abundance within plots. We generally found that volunteers perform almost as well as [illegible] some areas, but that we should be cautious [illegible]. We analyzed predictors of [illegible]

Crall et al. 2011

The challenge of spatial variability



Citizen Science as an Ecological Research Tool: Challenges and Benefits

Janis L. Dickinson, Benjamin Zuckerberg, and David N. Bonter

Key Words

biodiversity, climate change, crowdsourcing, fragmentation, geographical ecology, habitat loss, invasive species, macroecology, monitoring, observer quality, population ecology, sampling bias, sampling error, spatial ecology

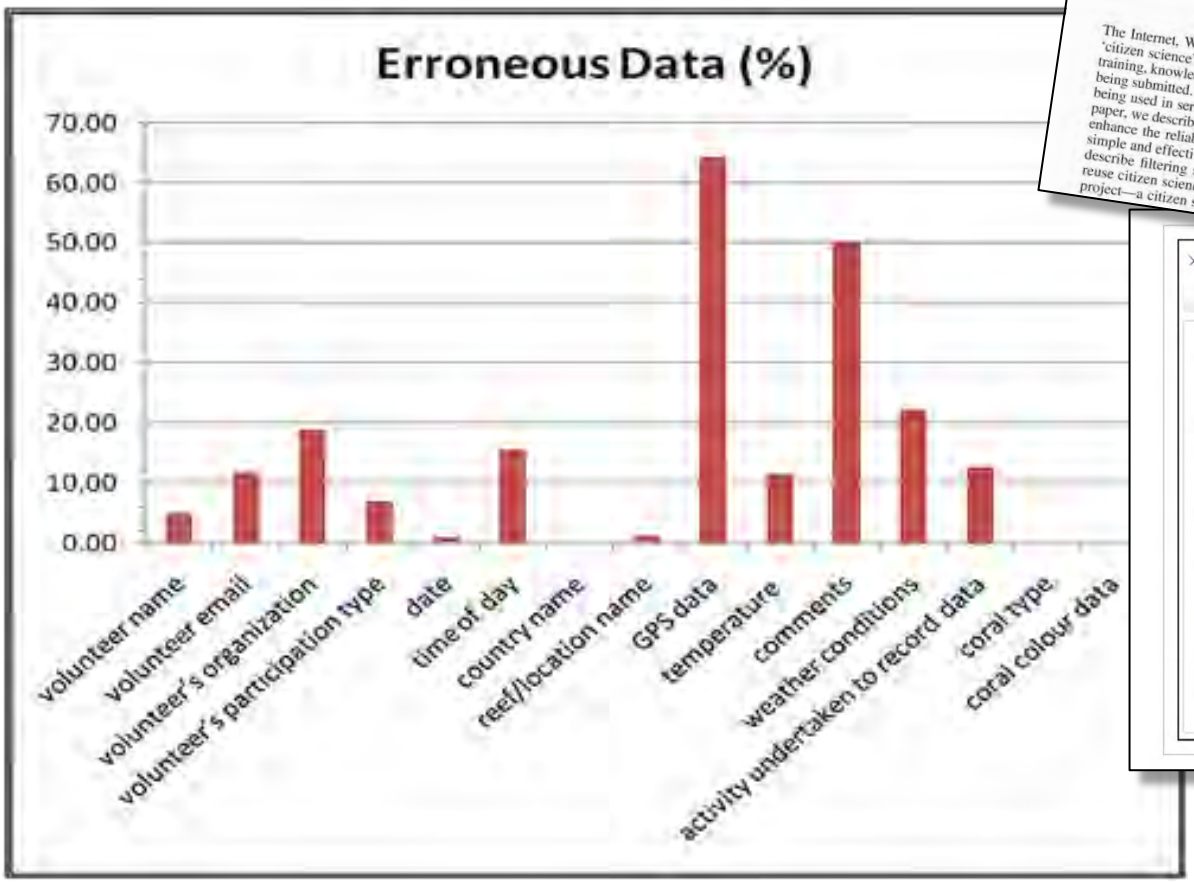
Abstract

Citizen science, the involvement of volunteers in research, has increased the scale of ecological field studies with continent-wide, centralized monitoring efforts and, more rarely, tapping of volunteers to conduct large, coordinated, field experiments. The unique benefit for the field of ecology lies in

The results represent the habitats of people, not necessarily birds

Dickinson et al. 2010

…and what mistakes do they do?



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Concurrency Computat.: Pract. Exper. 2013; **25**:454–466
Published online 13 September 2012 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/cpe.2923

SPECIAL ISSUE PAPER

Assessing the quality and trustworthiness of citizen science data

Jane Hunter[1,*,†], Abdulmonem Alabri[1] and Catharine van Ingen[2]
[1]*The University of Queensland, Brisbane QLD 4072, Australia*
[2]*Microsoft Research, San Francisco, CA, USA*

SUMMARY

The Internet, Web 2.0 and Social Networking technologies are enabling citizens to actively participate in 'citizen science' projects by contributing data to scientific programmes via the Web. However, the limited training, knowledge and expertise of contributors can lead to poor quality, misleading or even malicious data being submitted. Subsequently, the scientific community often perceive citizen science data as not worthy of being used in serious scientific research—which in turn, leads to poor retention rates for volunteers. In this paper, we describe a technological framework that combines data quality improvements and trust metrics to enhance the reliability of citizen science data. We describe how online social trust models can provide a simple and effective mechanism for measuring the trustworthiness of community-generated data. We also describe filtering services that remove unreliable or untrusted data and enable scientists to confidently reuse citizen science data. The resulting software services are evaluated in the context of the CoralWatch project—a citizen science project that uses volunteers to collect comprehensive data on coral reef health.

Hunter et al. 2013

What do we know about public upsides?

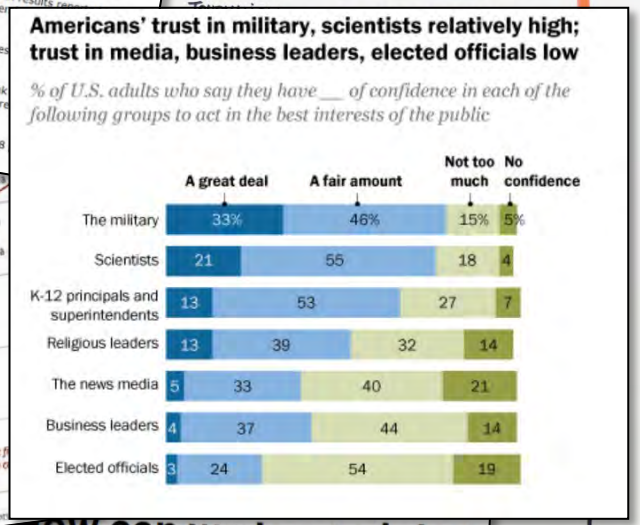
- Will it reduce the mistrust of science?
  - Climate changes
  - Conservation issues
- Will people learn more about the nature?
- Will people treat the nature better?

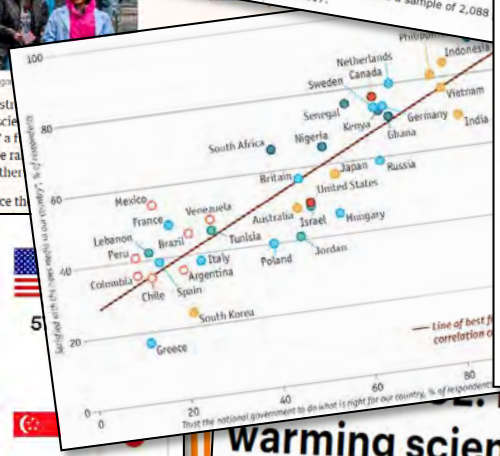
Motivator	Primary
Interest in the environment	36.5
Interest in protecting a local natural area or resource	21.2
General interest in science	15.4
Interest in natural resource management	11.5
Interest in citizen science	7.7
Curiosity	3.8

Interest in local environment is the most important driver

Frensley et al. 2017

Trust in science has become a major issue





warming scientists if they keep twisting the truth

By DAVID ROSE FOR THE MAIL ON SUNDAY
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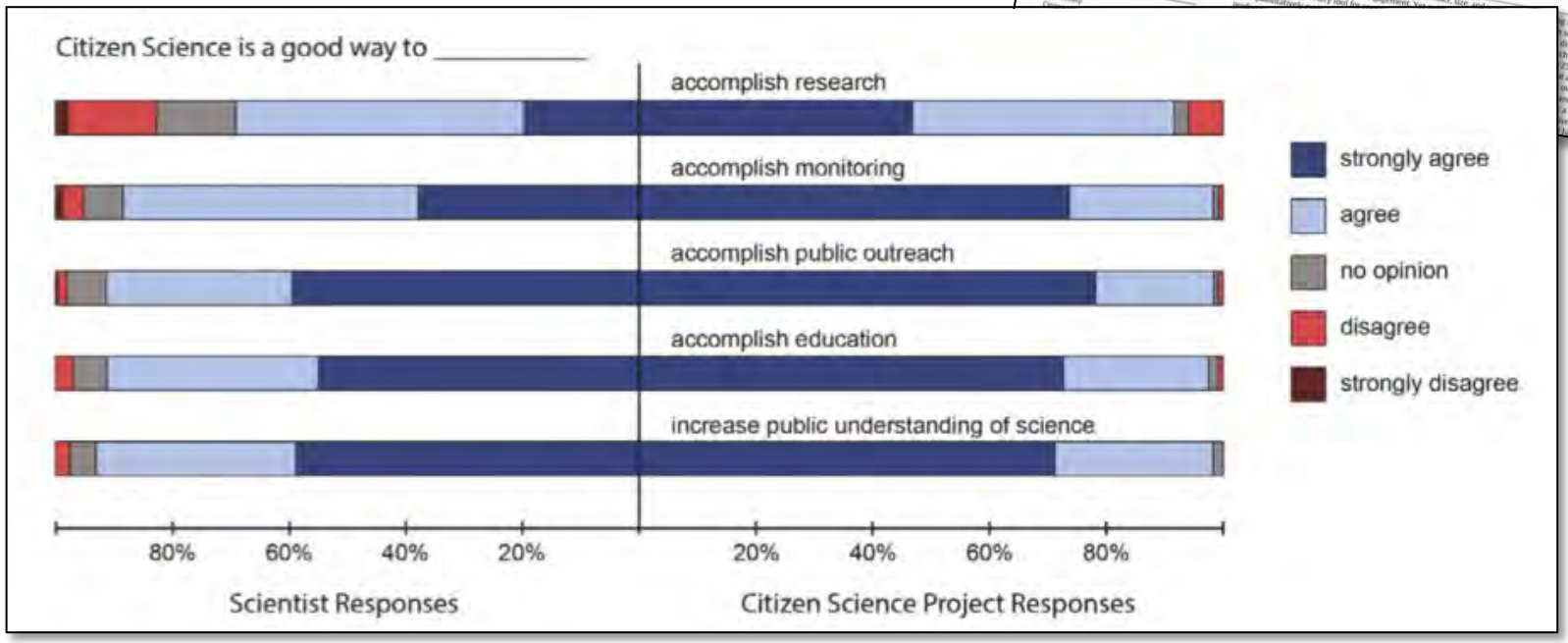
The reason to conduct citizen science is not necessarily research

Survey among scientists and citizen science project leaders



Burgress et al. 2016

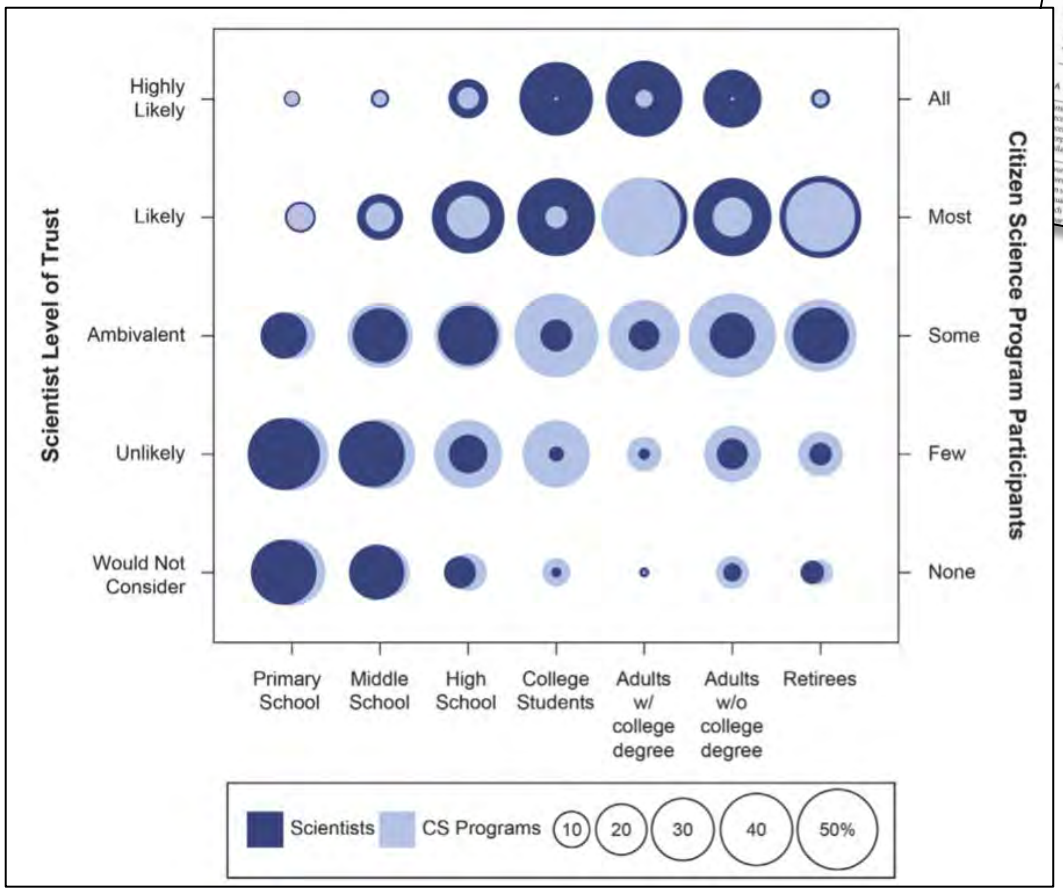
What do we know about public downsides?

- Misuse of people only to save money?
- Used for unsound research ideas?
- Used for unethical research
  - Methods, e.g. animal welfare issues
- Little control of safety issues
- Collect illegal data sources
  - E.g. human data

Naïve to think that this will not happen – how can we prevent it?

Photo: Børge Damsgård

All citizen science is not for everyone



High school, college and adults are the most important groups

Burgress et al. 2016

How can we develop a citizen science project?

1. Define the scientific question

2. Develop a protocol for all methods and educational activities
    - Define the participant group
    - Test out the methods for that specific group
    - Develop data management protocols
    - Check safety and ethical consideration

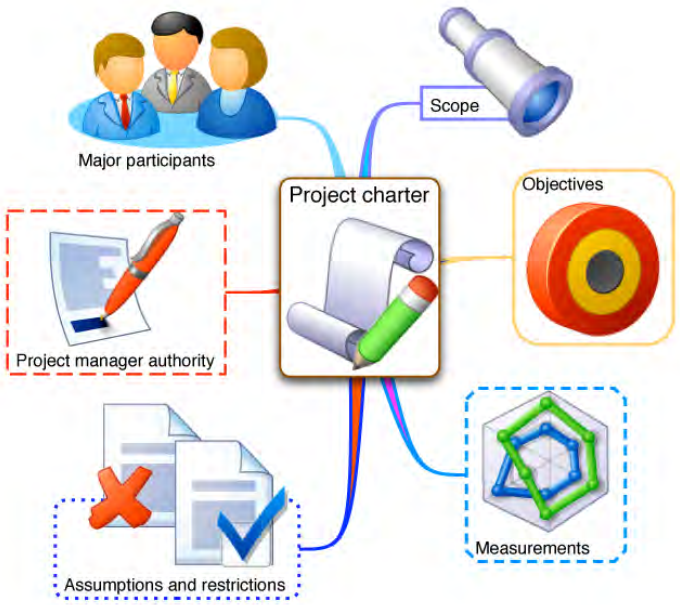
3. Recruit participants

4. Conduct method training

5. Follow up during the sampling period

6. Disseminate results (during and after)

7. Evaluate outcome and impact



Discuss with the person next to you

What citizen science project could be used in your research area?

Take-home-message

- Citizen science is an opportunity. Sometimes!
- Has to be linked to a research institute
- Needs careful considereations of group and methods
- Needs to be linked to an educational aspect

The biggest achivement is not necessarily the scientific result, but a greater trust that science can improve our planet

Thank you for your attention!

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Photo: Børge Damsgård