

Citizen Science Resources
Global Ocean Science Education Workshop
UNESCO Headquarters, Paris, France
Effective Practices in Ocean Citizen Science
Wednesday, June 15, 2016

Books and Reports about Citizen Science

Education

Bonney R, Ballard H, Jordan R, McCallie E, Phillips T, Shirk J, et al. (2009). Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. Center for Advancement of Informal Science Education (CAISE), Washington D.C.

Phillips T, Furguson M, Minarchek M, Porticella N, Bonney R (2014) Users guide for evaluating learning outcomes from citizen science. Cornell Lab of Ornithology, Ithaca, NY.

European Perspective on Citizen Science for the Environment

Roy HE, Pocock MJO, Preston CD, Roy DB, Savage J, Tweddle JC, et al. (2012). Understanding citizen science and environmental monitoring. Final report on behalf of UK Environmental Observation Framework. Centre for Ecology & Hydrology, Wallingford.

Tweddle JC, Robinson LD, Pocock MJO, Roy HE (2012). Guide to citizen science: developing, implementing and evaluating citizen science to study biodiversity and the environment in the UK. Natural History Museum and NERC Centre for Ecology & Hydrology for UK-EOF. Available online: www.ukeof.org.uk

Science Communication Unit, University of the West of England, Bristol (2013). *Science for Environment Policy In-depth Report: Environmental Citizen Science*. Report produced for the European Commission DG Environment, December 2013. Available at: <http://ec.europa.eu/science-environment-policy>

Pocock MJO, Chapman DS, Sheppard LJ, Roy HE (2014). A Strategic Framework to Support the Implementation of Citizen Science for Environmental Monitoring. Final report to SEPA. Centre for Ecology & Hydrology, Wallingford, Oxfordshire.

Haklay M (2015) Citizen Science and Policy: A European Perspective
https://www.wilsoncenter.org/sites/default/files/Citizen_Science_Policy_European_Perspective_Haklay.pdf

Key Scientific Papers about Citizen Science

- Bonney R., Cooper CB, Dickinson J, Kelling S, Phillips T, Rosenberg KV, Shirk J (2009). Citizen science: a developing tool for expanding science knowledge and scientific literacy. *BioScience*, 59(11), 977-984.
- Cohn, J.P (2008). Citizen science: Can volunteers do real research?. *BioScience*, 58(3), 192-197.
- Conrad CC, Hilchey KG (2011). A review of citizen science and community-based environmental monitoring: issues and opportunities. *Environmental monitoring and assessment*, 176(1-4), 273-291.
- Cooper CB, Dickinson J, Phillips T, Bonney R. (2007). Citizen science as a tool for conservation in residential ecosystems. *Ecology and Society*, 12(2), 11.
- Cox J, Oh EY, Simmons B, Lintott C, Masters K, Greenhill A, ... Holmes K. (2015). Defining and Measuring Success in Online Citizen Science: A Case Study of Zooniverse Projects. *Computing in Science & Engineering*, 17(4), 28-41.
- Danielsen F, Burgess ND, Balmford A, et al. (2009) Local participation in natural resource monitoring: a characterization of approaches. *Conserv Biol* 23: 31–42.
- Delaney DG, Sperling CD, Adams CS, Leung B (2007) ‘Marine invasive species: validation of citizen science and implications for national monitoring networks’. *Biological Invasions* 10 (1), 117 – 128.
- Dickinson JL, Zuckerberg B, Bonter DN (2010) Citizen science as an ecological research tool: challenges and benefits. *Annual Review of Ecology, Evolution, and Systematics*. 41:149–72.
- Gommerman L, Monroe MC (2012). Lessons Learned from Evaluations of Citizen Science Are Data Collected by Citizen What Contexts Are Most, (May), 1–5.
- Haklay M. (2013). Citizen science and volunteered geographic information: Overview and typology of participation. In *Crowdsourcing geographic knowledge* (pp. 105-122). Springer Netherlands.
- Kullenberg C, & Kasperowski D (2016). What Is Citizen Science?—A Scientometric Meta-Analysis. *PloS one*, 11(1), e0147152.
- Pandya RE (2012). A framework for engaging diverse communities in Citizen science in the US. *Frontiers in Ecology and the Environment*, 10(6), 314–317. <http://doi.org/10.1890/120007>
- Pocock, MJ, Roy HE, Preston CD, Roy DB (2015). The biological records centre: A pioneer of citizen science. *Biological Journal of the Linnean Society*, 115(3), 475-493.
- Silvertown J (2009) A new dawn for citizen science. *Trends in Ecology & Evolution*. 24(9):467–71.
- Theobald EJ, Ettinger AK, Burgess HK, DeBey LB, Schmidt NR, Froehlich HE ... Parrish JK (2015). Global change and local solutions: Tapping the unrealized potential of citizen science for biodiversity research. *Biological Conservation*, 181, 236-244.
- Wiggins A, Crowston K (2011, January). From conservation to crowdsourcing: A typology of citizen science. In *System Sciences (HICSS), 2011 44th Hawaii international conference on* (pp. 1-10). IEEE.

Other Sources of Information About Citizen Science

Journal

Citizen Science: Theory and Practice sponsored by the Citizen Science Association

Collections of Papers

- 1) Biodiversity and Conservation (2005) Volume 14, Issue 11 DOI 10.1007/s10531-005-8375-0.
- 2) e-Science Workshops (eScienceW) (2011) IEEE Seventh International Conference on Citizen Science, Stockholm Sweden, 5-8 Dec. 2011.
- 3) Frontiers in Ecology and the Environment, August 2012, Volume 10, Issue 6.
- 4) Human Computation (2014) Volume 1, No 2.
- 5) Biological Journal of the Linnean Society, July 2015, Volume 115, Issue 3.
- 6) Journal of Microbiology & Biology Education, March 2016, Volume 17, Issue 1.
- 7) Conservation Biology, June 2016, Volume 30, Issue 3.

Websites that have general information about citizen science

Citizen Science Toolkit	http://www.birds.cornell.edu/citscitoolkit/toolkit
Scistarter	https://scistarter.com/
Wilson Center	https://www.wilsoncenter.org/research/Commons%20Lab
US Government	https://www.citizen-science.gov/
Monitoring Matters	http://www.monitoringmatters.org/
UK EOF	http://www.ukeof.org.uk/resources/citizen-science-resources/guide-to-citizen-science-form

Blogs

<http://blogs.plos.org/citizensci/>

Twitter Accounts

@SeaChange_EU

@SealifeSurvey

@ShoreThing_MBA

@CapturingRCoast

List Serves

extvolmonnetwork@list.uvm.edu

citizen-science@extension.org

citsci-discussion-1@cornell.edu

Associations

Citizen Science Association

<https://citizenscienceassociation.org/>

Australian Citizen Science Association

<http://csna.gaiaresources.com.au/wordpress/>

European Citizen Science Association

<http://ecsa.citizen-science.net/>

Citizen Science Alliance

<http://www.citizen-sciencealliance.org/>

(runs Zooniverse projects)

(Check each Association's websites for information about meetings)

Citizen Science Websites

Citizenscience.gov – <http://www.citizenscience.gov>

CitSci.org – <http://citsci.org>

Citizen Science Alliance – <http://citizensciencealliance.org>

Citizen Science Association – <https://citizenscienceassociation.org/>

Discover Magazine – <http://blogs.discovermagazine.com/citizen-science-salon>

European Citizen Science Association – <http://ecsa.citizen-science.net/>

European Environment Agency – <http://www.eea.europa.eu/themes/biodiversity/biodiversity-monitoring-through-citizen-science>

Jelly Watch -- <http://www.jellywatch.org/>

Marine Debris -- <http://www.marinedebris.engr.uga.edu/>

Scientific American – <http://www.scientificamerican.com/citizen-science/>

SciStarter – <http://scistarter.com>

Seafloor Explorer <https://www.seafloorexplorer.org/>

Socientize – <http://www.socientize.eu>

Zooniverse – <https://www.zooniverse.org/>

Technical Aspects: Software & Informatics Resources

Citizen Science Platforms

Zooinverse
CitSci.org
iNaturalist
iRecord
ISpot
Sealife Tracker
iSeahorse

Platforms to build collection apps for Citizen Science

ArcCollector
CitSci.org
Cybertraker
EpiCollect
FieldScope
GIS Cloud
OpenDataKit

Standard Terms for Citizen Science

<https://www.wilsoncenter.org/article/ppsr-core-metadata-standards>

Examples of Citizen Science Projects

I) REEF (Reef Environmental Education Foundation; www.reef.org)

Over 13,000 volunteer divers and snorkelers have participated, and collectively they have submitted over 7.8 million records of fish, invertebrate, and algae sightings from 11,353 sites worldwide. The database includes sightings information on over 3,400 marine species. REEF receives an average of 862 surveys per month, with peak submissions exceeding 1,200 in the summer months. Chief Scientist: Christy Semmens, christy@reef.org

II) Sea Change Project (www.seachangeproject.eu)

One of the tasks under the EU H2020 funded Sea Change project is to develop a Citizen Science project across Europe that will collect data on the distribution and abundance of native and non-native crab species. For more details contact Fiona Crouch (Sea Change Project Manager), Marine Biological Association, ficr@mba.ac.uk

III) He'eia Fishpond (<http://laip-heeia.blogspot.com/>)

The Laulima A 'Ike Pono (LAIP) program at He'eia Fishpond introduced Hawaiian and Pacific Island students and community members to authentic geoscience research within a local ecosystem that holds high cultural significance. LAIP established a collaborative model for community science education through place-based biogeoscience research and training. Over the course of the program, six cohorts of interns completed 200 hours of work during six-month sessions. (<http://www.hawaii.edu/himb/Education/lokoiaapp/>)

IV) The Shore Thing Project (www.mba.ac.uk/shore_thing)

The Shore Thing is an initiative of the Marine Biological Association, working with schools and community groups around the British Isles to collect information on rocky sea shore life. The project follows on from the UK's Marine Biodiversity and Climate Change Programme (MarClim). MarClim provides evidence that recent climate change has altered the abundance, population structure and biogeographic ranges of a number of intertidal indicator species. The survey protocol and methodologies have been developed from MarClim. All the information collected by volunteers is available online and will help to build a picture of the present state of UK rocky shores and measure change in the future.

V) Capturing our Coast (www.capturingourcoast.co.uk)

This project aims to develop a network of citizen scientists who can help us build an accurate picture of marine life all around the UK - a baseline against which we can better understand the impact of climate change and other environmental and human factors.

VI) Seasearch (www.seasearch.org.uk)

Seasearch is a project for volunteer sports divers who have an interest in what they're seeing under water, want to learn more, and want to help protect the marine environment around the coasts of Britain and Ireland. The main aim is to map out the various types of sea bed found in the near-shore zone around the whole of the Britain and Ireland. In addition we are recording what lives in each area, establishing the richest sites for marine life, the sites where there are problems and the sites which need protection.

VII) ShoreSearch

Shoresearch is a user-friendly and fun method of exploring the shore and recording the species and habitats found there.

VIII) Wakame Watch (www.wakamewatch.org.uk)

Wakame (*Undaria pinnatifida*) is a large species of seaweed originating from the Pacific and is considered by the IUCN Invasive Specialist Group to be one of the 100 'world's worst' invasive species, due to its potential to impact ecological and economic interests. Scientists do not currently believe that the true spread of the species is known for Great Britain and North West Europe. Producing an accurate distribution of this species is important in terms of managing and controlling spread. Wakame Watch has been established in order to generate an up-to-date picture of the distribution of the species by encouraging recording of sightings from the public. In particular, we are asking divers, snorkelers, recreational boat users, fishermen and environmental surveyors to let us know when they encounter the species.

IX) Chinese Mitten Crab Recording (www.mittencrabs.org.uk)

Chinese mitten crabs are officially listed as one of the World's 100 worst invasive species. They can cause damage to fishing gear and river banks, block intake screens, modify natural habitats and compete with native species. It is this economic and ecological damage that makes this crab such an unwelcome arrival. The full extent of these exotic pests in English and Welsh waters is currently unclear and a consortium of research institutes is requesting mitten crab sightings from members of the public, anglers and waterway workers, to clarify the distribution of this species.

X) Sealife Survey (www.mba.ac.uk/recording)

Warming seas, non-native invaders and human activities are all affecting our marine environment. Records of marine life are needed to inform decision-makers, to track changes, to find out why things are changing and, let's not forget, because recording is fun!

XI) Great Eggcase hunt (www.sharktrust.org/en/great_eggcase_hunt)

The Great Eggcase Hunt aims to get as many people as possible hunting for eggcases that have either been washed ashore, or are found by divers and snorkelers underwater. In recent decades, several species of shark, skate and ray around the British coast have dramatically declined in numbers. The empty eggcases (or mermaid's purses) are an easily accessible source of information on the whereabouts of potential nursery grounds and will provide the Trust with a better understanding of species abundance and distribution.

XII) BioLit (www.biolit.fr)

BioLit is a network of men and women involved in environmental management and protection. BioLit partners hope to share their knowledge of the coastline with the local community and help you to record what you see on the shore.

Ten principles of citizen science

Citizen science is a flexible concept which can be adapted and applied within diverse situations and disciplines. The statements below were developed by the '*Sharing best practice and building capacity*' working group of the **European Citizen Science Association**, led by the Natural History Museum London with input from many members of the Association, to set out some of the key principles which as a community we believe underlie good practice in citizen science.

- 1. Citizen science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding.**
Citizens may act as contributors, collaborators, or as project leader and have a meaningful role in the project.
- 2. Citizen science projects have a genuine science outcome.**
For example, answering a research question or informing conservation action, management decisions or environmental policy.
- 3. Both the professional scientists and the citizen scientists benefit from taking part.**
Benefits may include the publication of research outputs, learning opportunities, personal enjoyment, social benefits, satisfaction through contributing to scientific evidence e.g. to address local, national and international issues, and through that, the potential to influence policy.
- 4. Citizen scientists may, if they wish, participate in multiple stages of the scientific process.**
This may include developing the research question, designing the method, gathering and analysing data, and communicating the results.
- 5. Citizen scientists receive feedback from the project.**
For example, how their data are being used and what the research, policy or societal outcomes are.
- 6. Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.**
However unlike traditional research approaches, citizen science provides opportunity for greater public engagement and democratisation of science.
- 7. Citizen science project data and meta-data are made publicly available and where possible, results are published in an open access format.**
Data sharing may occur during or after the project, unless there are security or privacy concerns that prevent this.
- 8. Citizen scientists are acknowledged in project results and publications.**
- 9. Citizen science programmes are evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.**
- 10. The leaders of citizen science projects take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities.**