Citizen Science: definitions, examples and the state of the art in Italy

Andrea Sforzi

EUROPEAN CITIZEN SCIENCE ASSOCIATION

Maremma Natural History Museum

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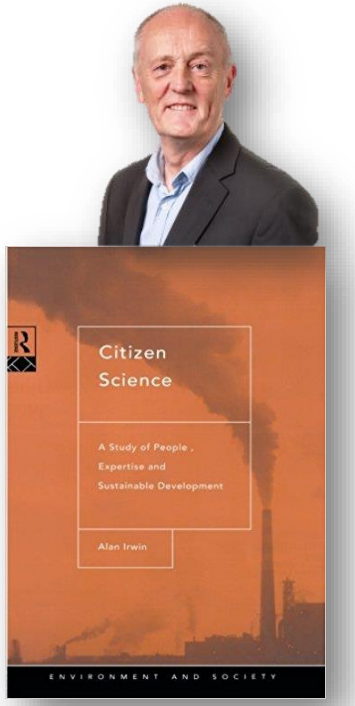
Museo di Storia Naturale della Maremma

The evolution of science

Source: M.Haklay, 2016

The rise of "Citizen Science"



Since1995, Citizen Science has been defined as:

- Expertize that exists among people traditionally seen as «ignorant» (Irwin, 1995);
- Research techniques that enlist the help of members of the public to gather scientific data (Bonney, 2009);

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, 2014

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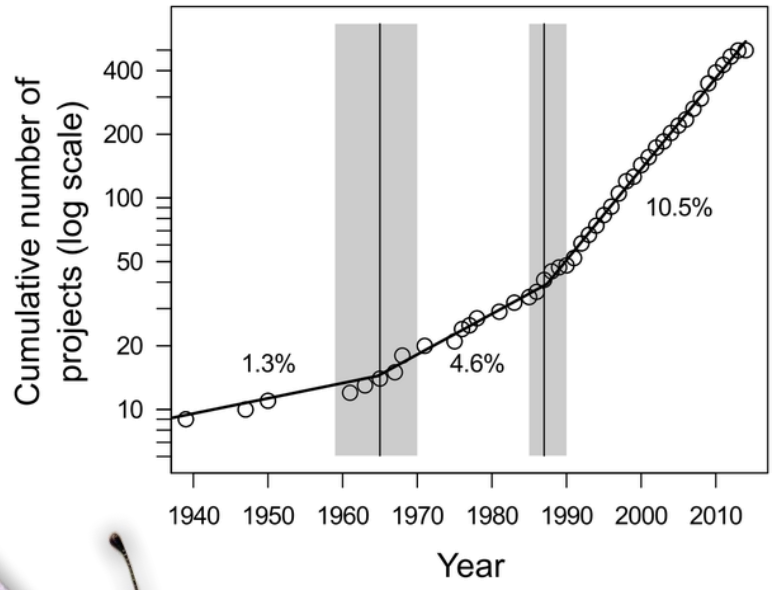
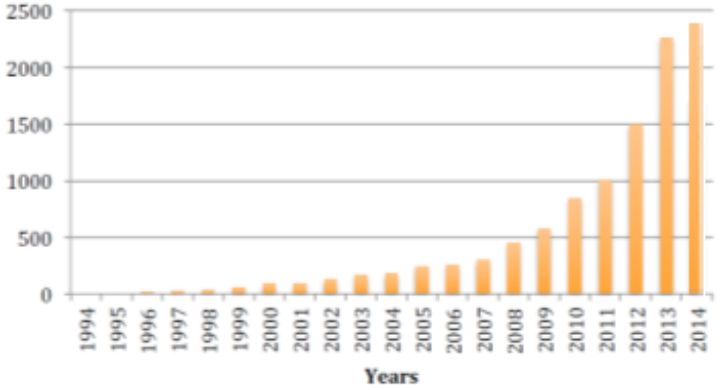
Scientific production ...

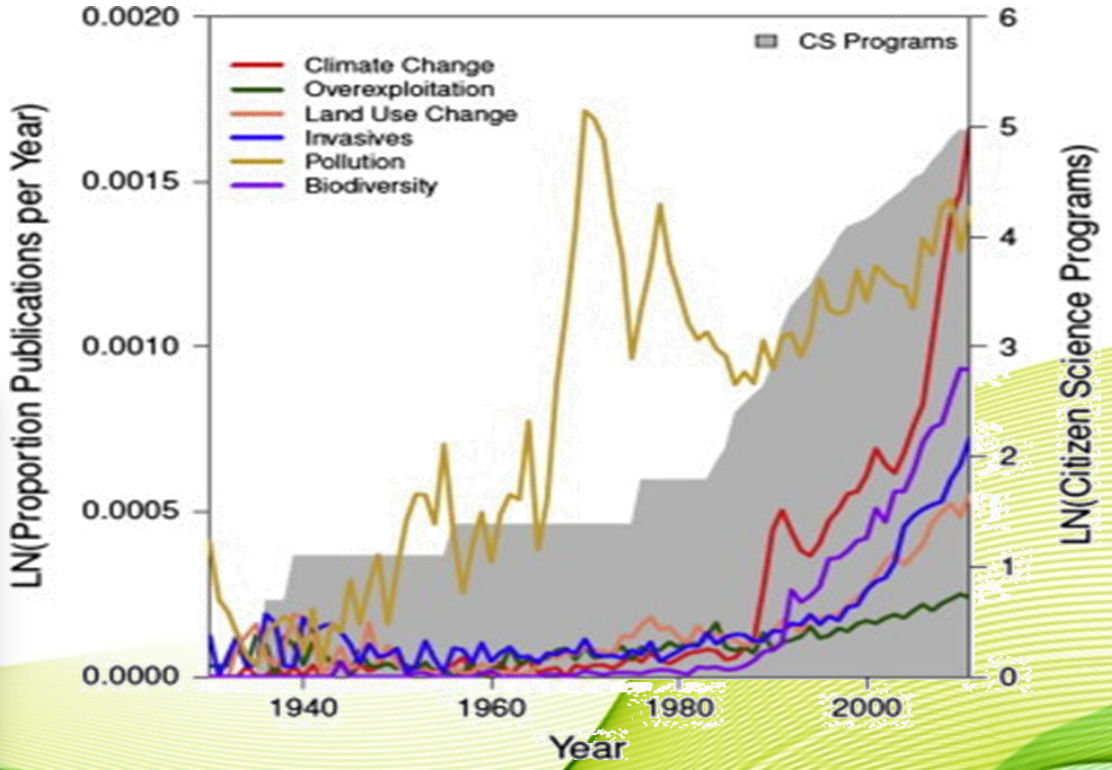


Source: Pocock *et al*. (2017)

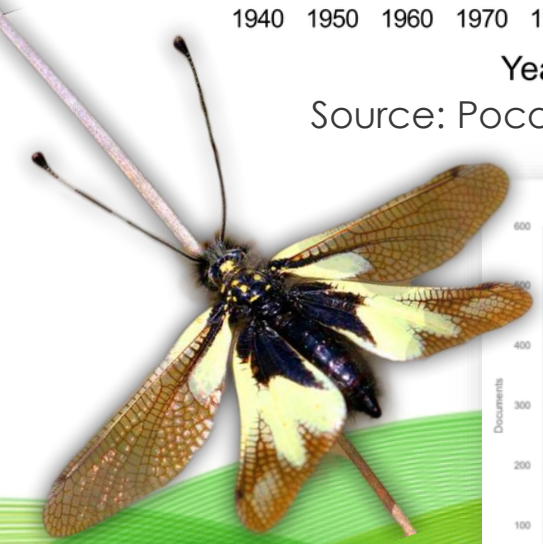
Rate of increase in the cumulative number of ecological and environmental citizen science projects as revealed by a systematic search.

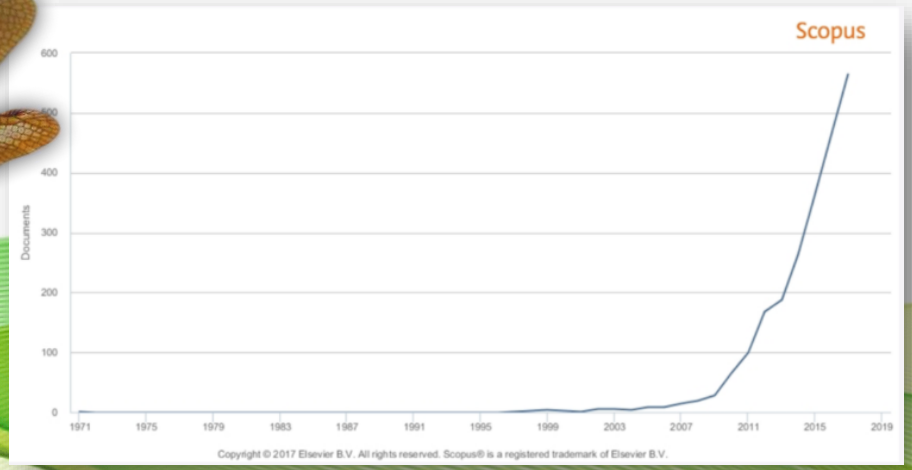


Citizen science publications trend in the last two decades, according to scholar.google.com, searching for «citizen science» + «project».



Source: Theobald *et al*. (2015)





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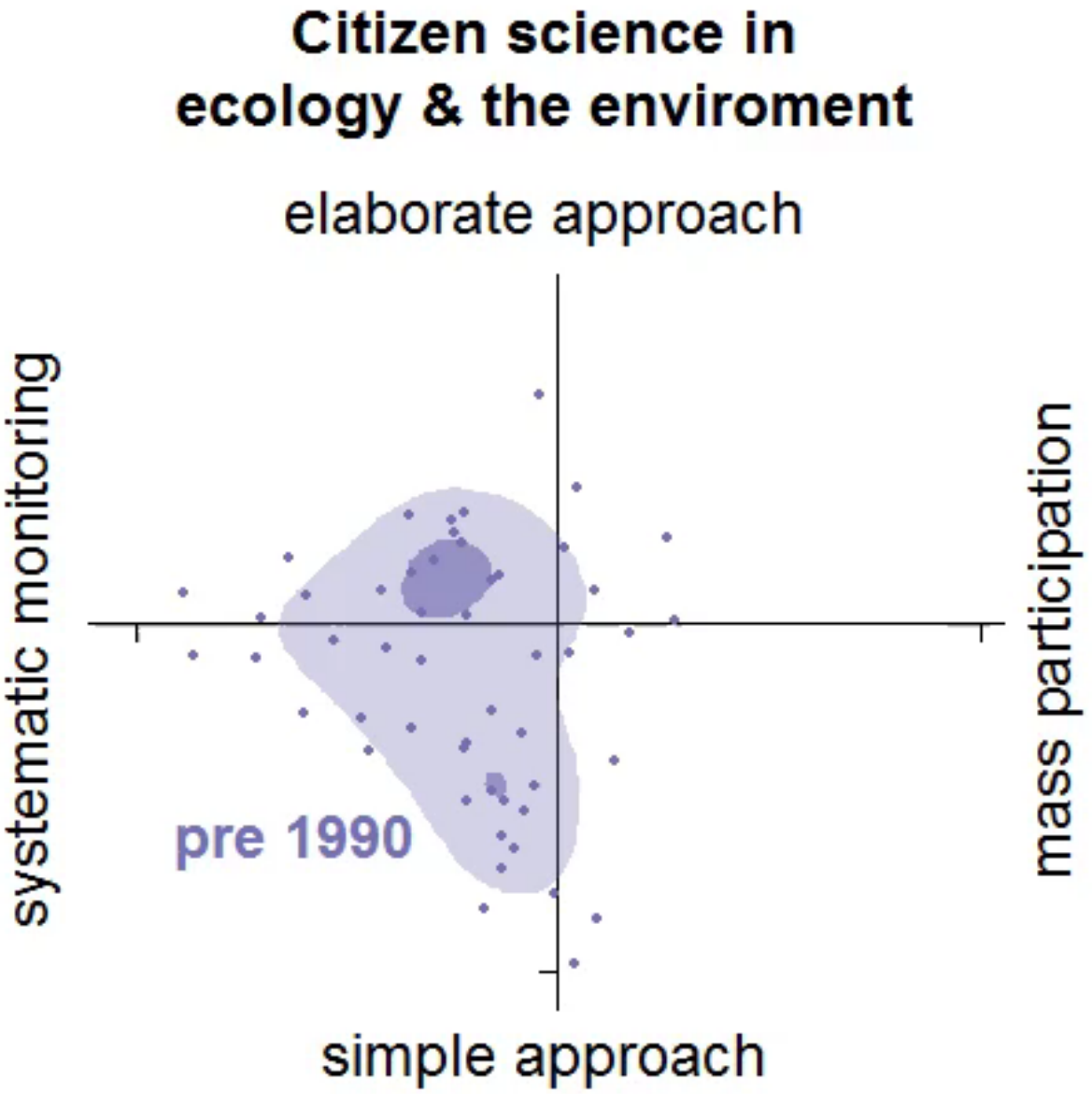
The landscape of citizen science described by a Multi-Factor Analysis (MFA) of 32 attributes of **509** citizen science projects in environmental and ecological science.



Source: Pocock *et al*. 2017. The diversity and evolution of ecological and environmental citizen science.

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Different approaches / levels of participation

	CONTRIBUTORY	COLLABORATIVE	CO-CREATED
Define a Question/Issue			✓
Gather Information			✓
Develop Explanations		✓	✓
Design Data Collection Methods	✓	✓	✓
Collect Samples	✓	✓	✓
Analyze Samples	✓	✓	✓
Analyze Data		✓	✓
Interpret Data/Conclude			✓
Disseminate Conclusions			✓
Discuss Results/Inquire Further			✓

Source: Bonney *et al.* (2009)

Level 4 'Extreme Citizen Science'
- Collaborative science – problem definition, data collection and analysis

Level 3 'Participatory science'
- Participation in problem definition and data collection

Level 2 'Distributed Intelligence'
- Citizens as basic interpreters
- Volunteered thinking

Level 1 'Crowdsourcing'
- Citizens as sensors
- Volunteered computing

Participatory levels of citizen science. Source: Haklay (2012).

Many declinations...

- **Passive sensing** (e.g. smartphones)
- **Partecipatory sensing**
- **Community science**
- **Volunteered computing**
- **Volunteered thinking** (citizens + scientists)
- **Environmental monitoring** (e.g. pollution, biodiversity...)

Enhance Environmental Awareness through Social Information Technologies

EVERYAWARE

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ZOONIVERSE

REAL SCIENCE ONLINE

ARTS

BIOLOGY

CLIMATE

HISTORY

LANGUAGE

LITERATURE

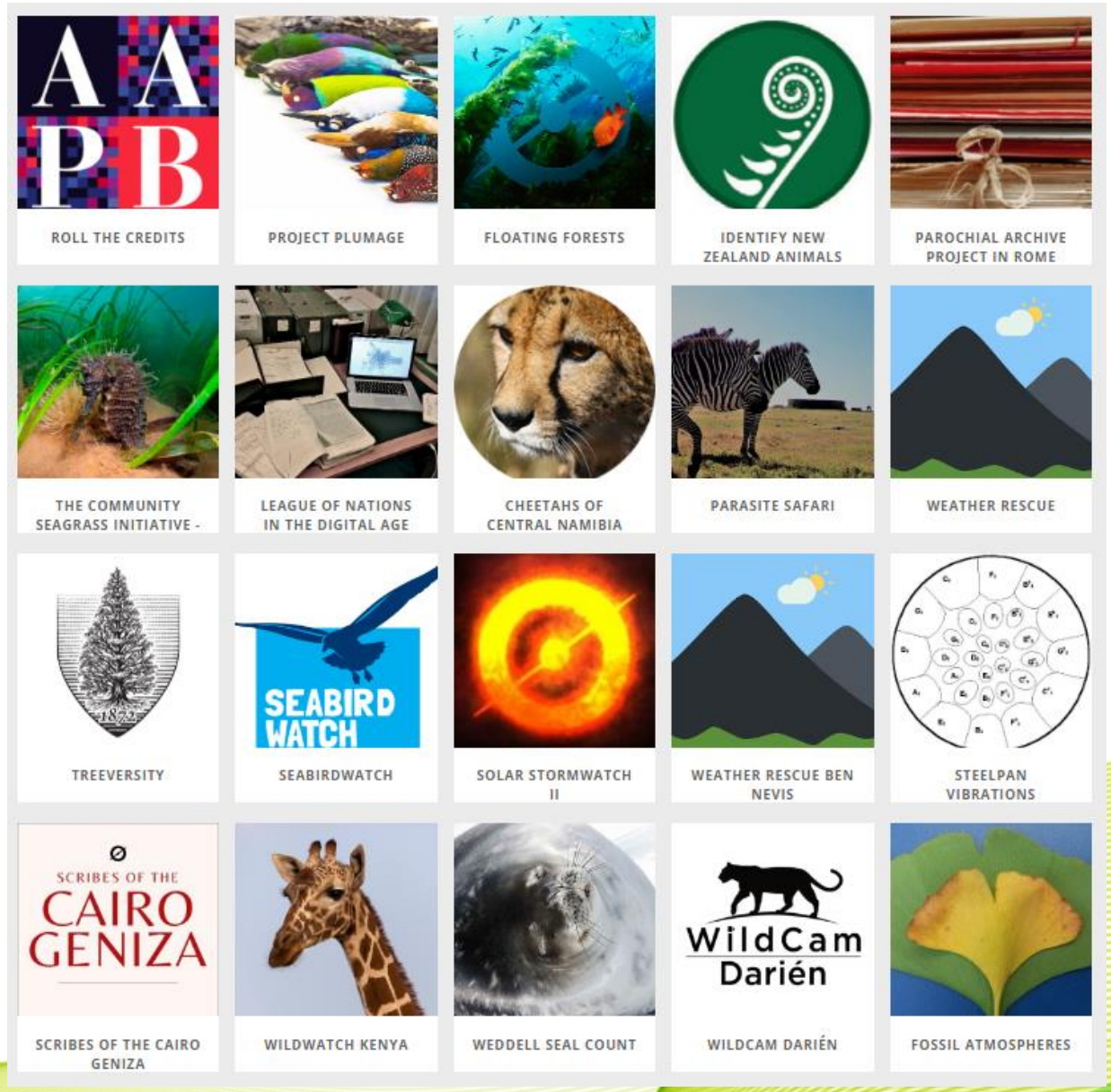
MEDICINE

NATURE

PHYSICS

SOCIAL SCIENCE

SPACE



90.251.913

CLASSIFICATIONS SO FAR,
BY 1.600.352 REGISTERED VOLUNTEERS

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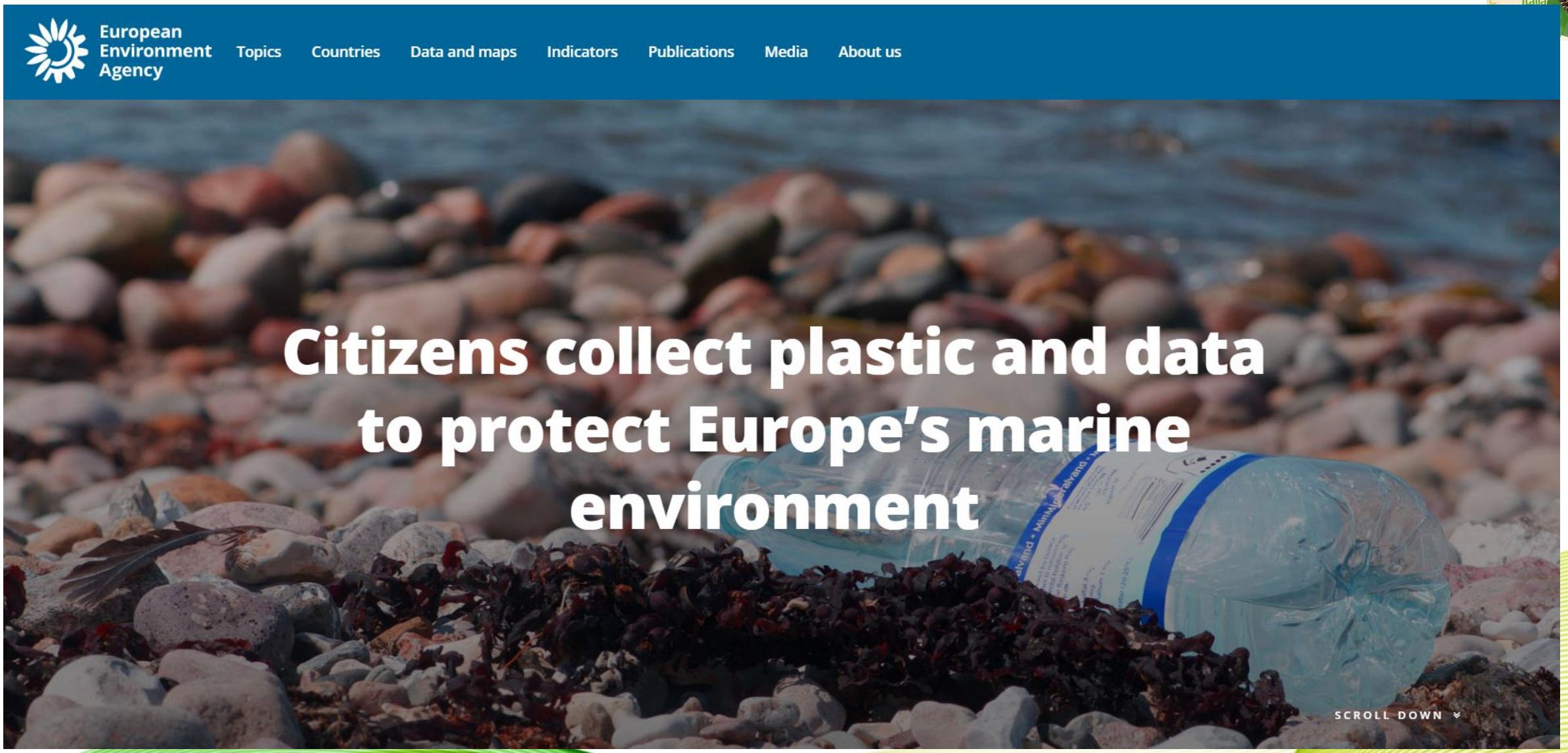

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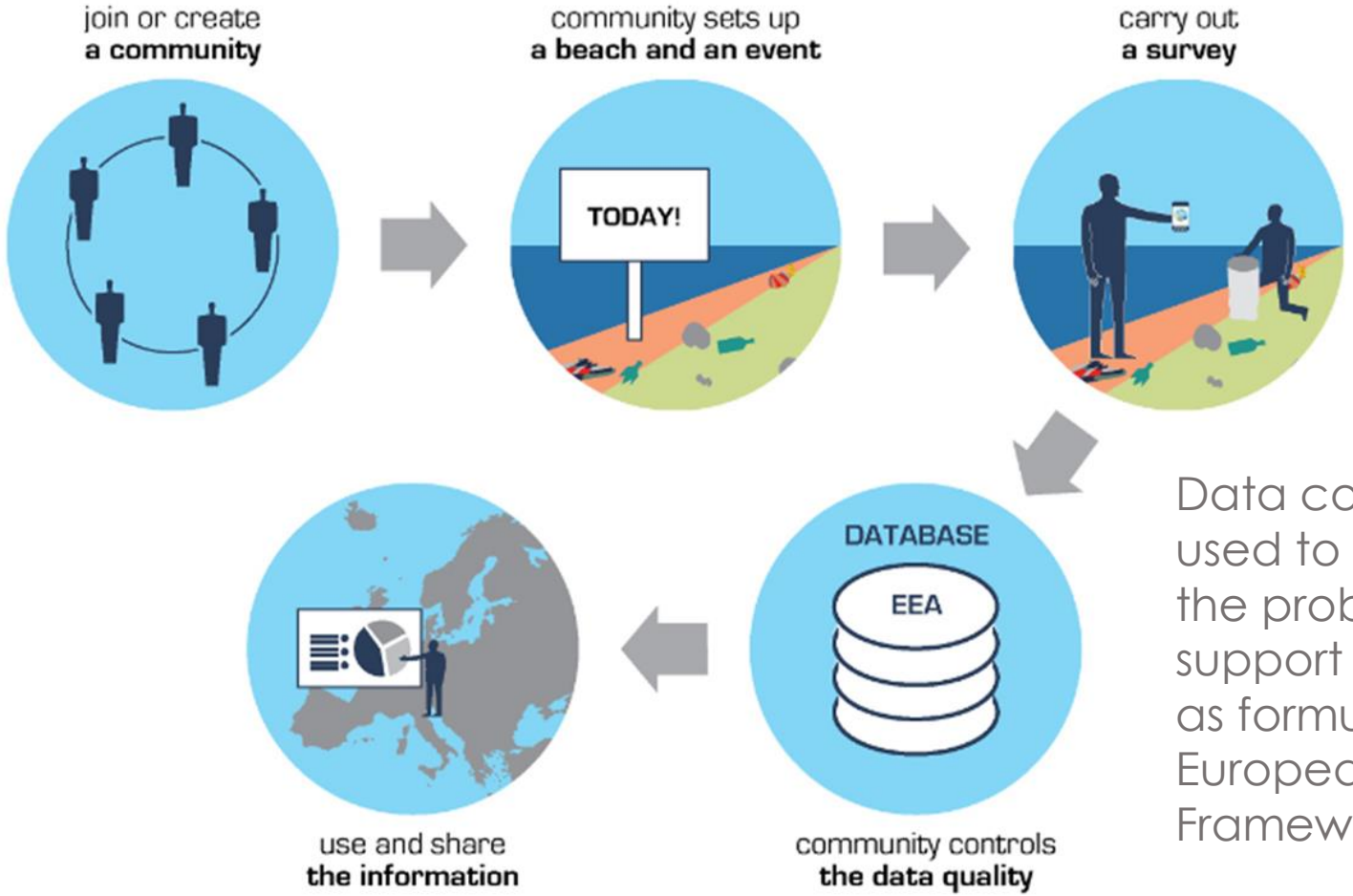
MLW, set-up in 2014 and involving non-governmental organisations and research institutions, is the only pan-European platform that members of the public can use to co-ordinate clean ups and record beach litter. It aims to complement the collection of official marine litter data by national authorities and fill data gaps.



Data collected will be used to better understand the problem, and will help support a policy response as formulated in the European Marine Strategy Framework Directive.

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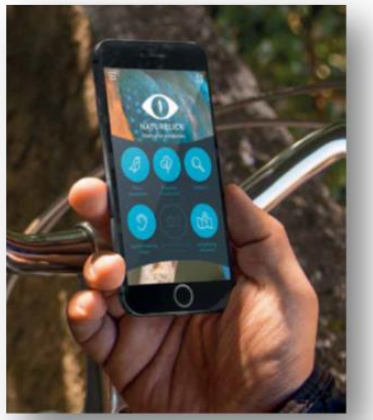
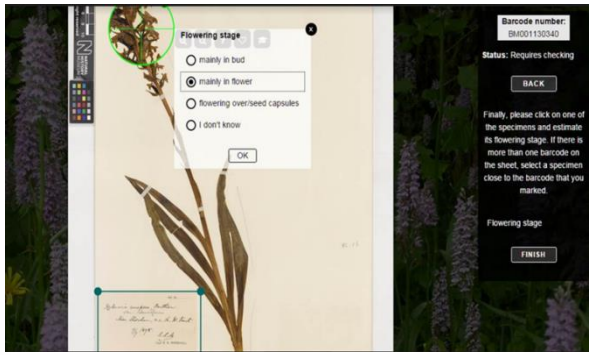
Digital tech.-mediated cs projects

museum für naturkunde berlin



MUSEUM NATIONAL D'HISTOIRE NATURELLE



Online crowdsourcing

NATURAL HISTORY MUSEUM

Miniature Fossils Magnified

At a glance

Transcribe microscope slide labels.

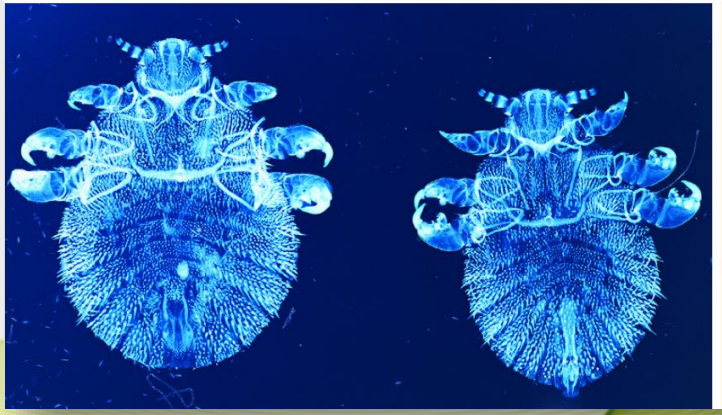
Type of activity: Online

Who can take part? Adults and students (Key Stage 4+)

When? Any time

How long will it take? Two minutes per slide

Miniature Lives Magnified



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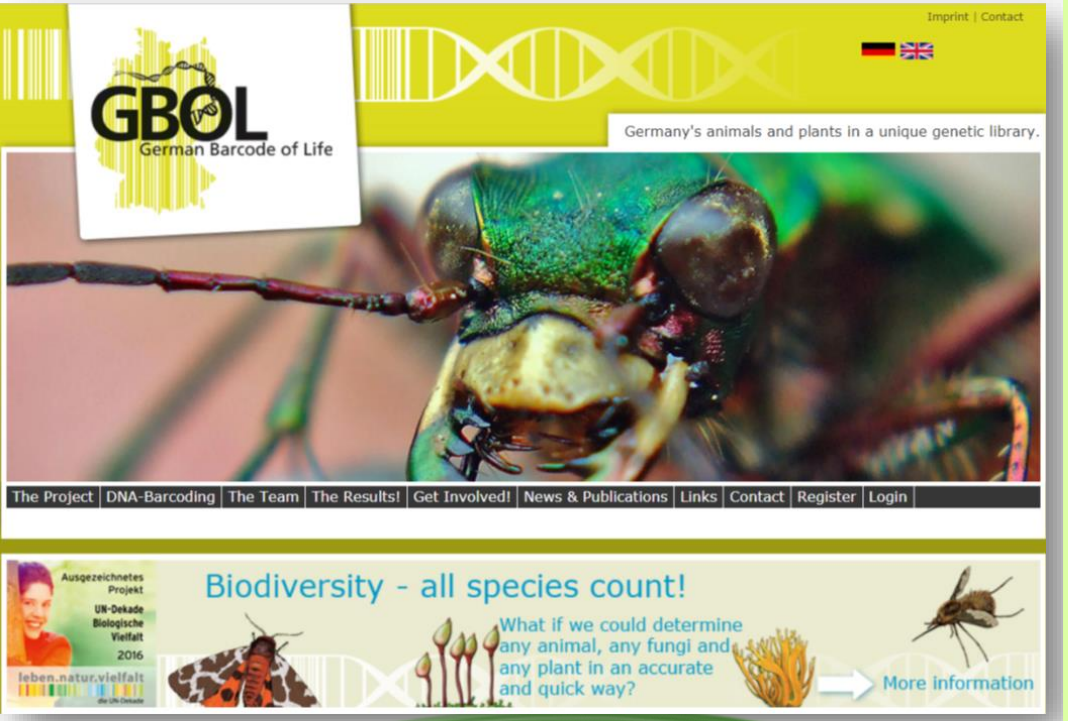
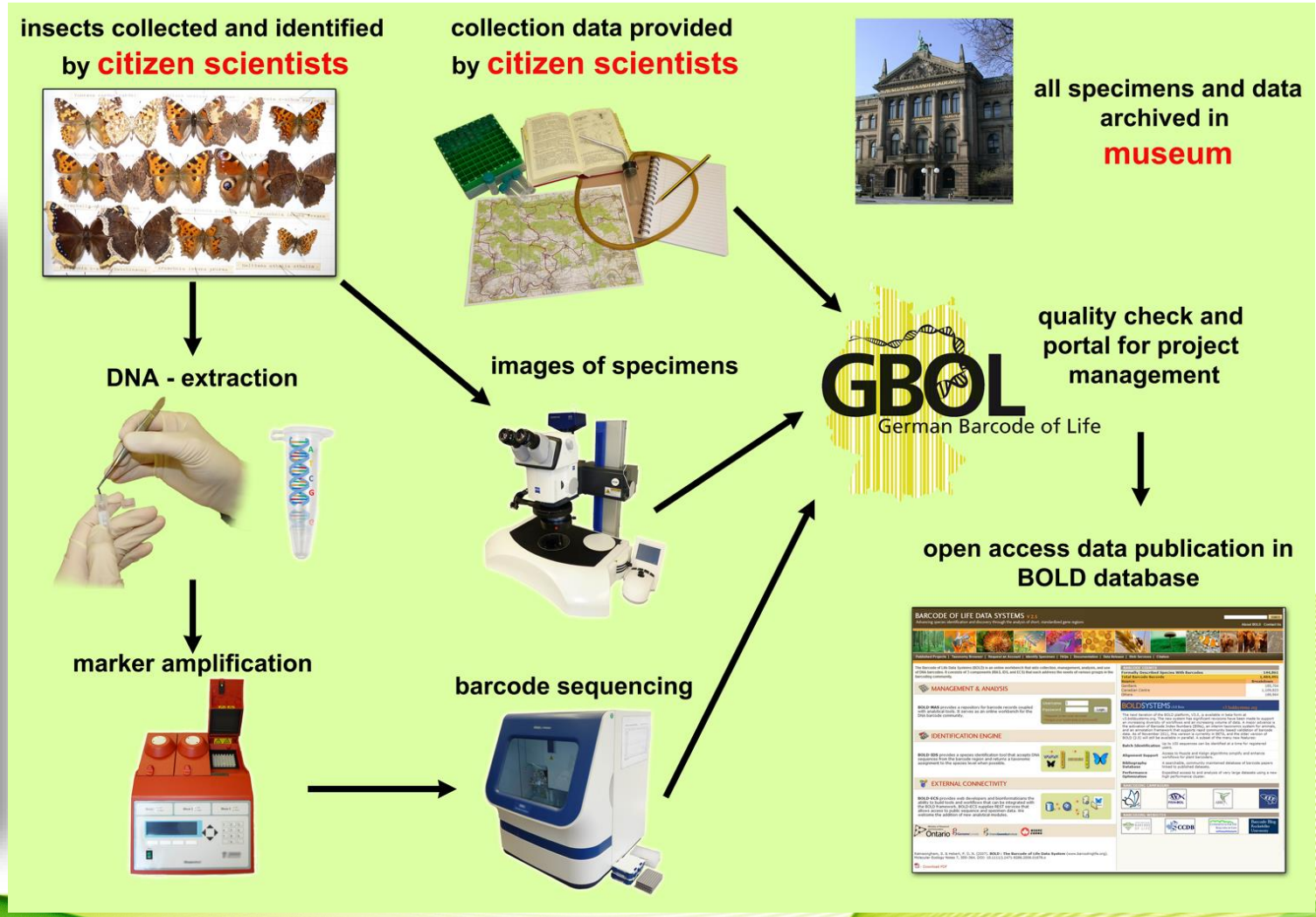
Digital tech.-mediated cs projects





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doing it together science

A collection of Citizen Science guidelines and publications

https://ecsa.citizen-science.net/blog/collection-citizen-science-guidelines-and-publications

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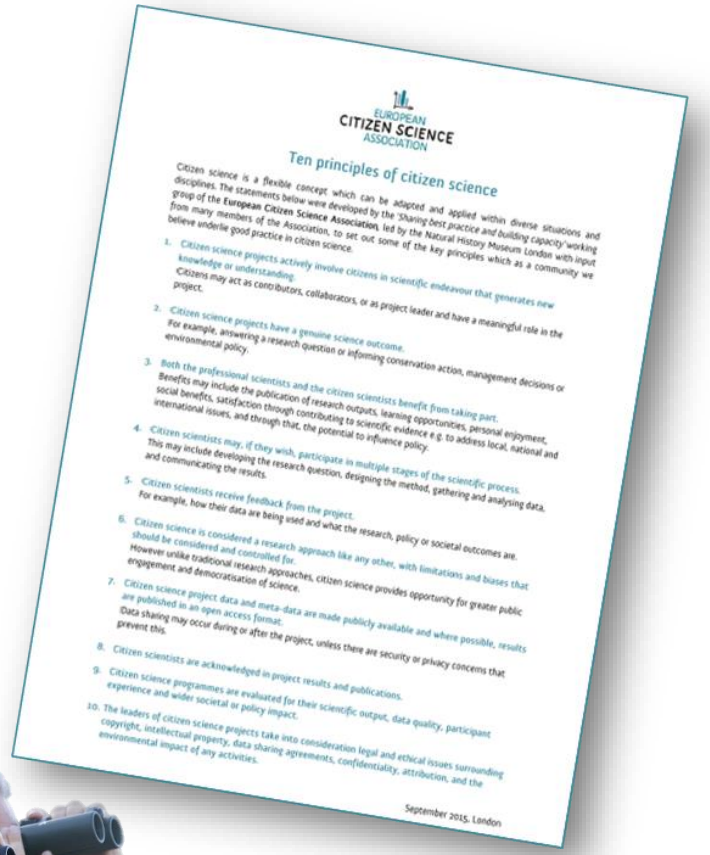

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Ten principles of citizen science

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.

September 2015, London

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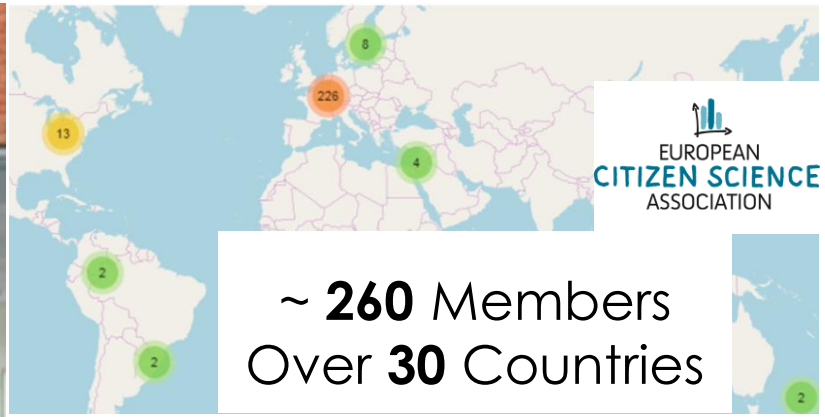
CITIZEN SCIENCE ASSOCIATION

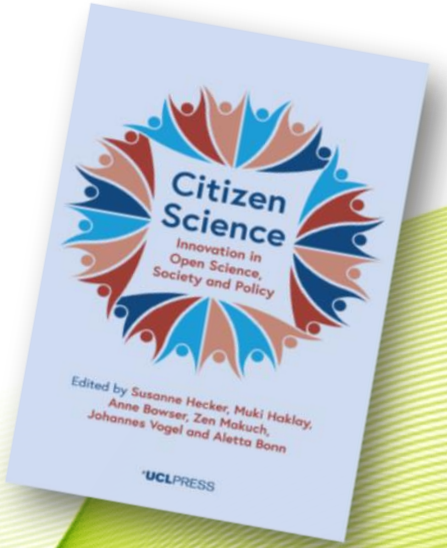
Australian Citizen Science Association

European Citizen Science Association

Mission:

Connecting citizens and science through fostering active participation





Vision:

Citizens in Europe are valued and empowered as key actors in advancing knowledge and innovation, supporting a sustainable development of our world.

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scistarter®
Science we can do together.

Project Finder

butterfly

Enter a location

Projects to do while...

Select a topic

only projects that...

Age group(s)

1-11 of 41

Gordon Dietzman, National Park Service

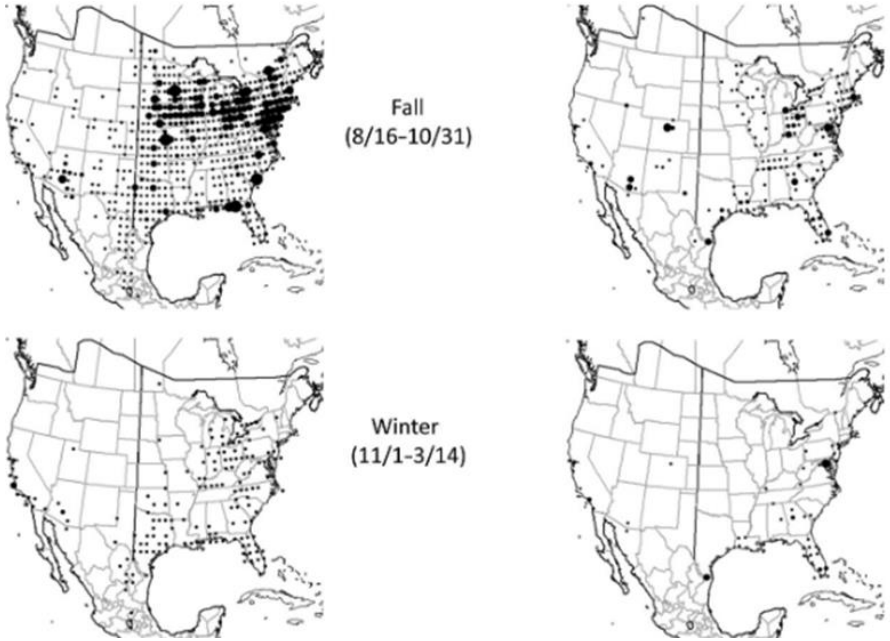
Monarch Larva Monitoring Project at Coldwater Spring (Minneapolis)

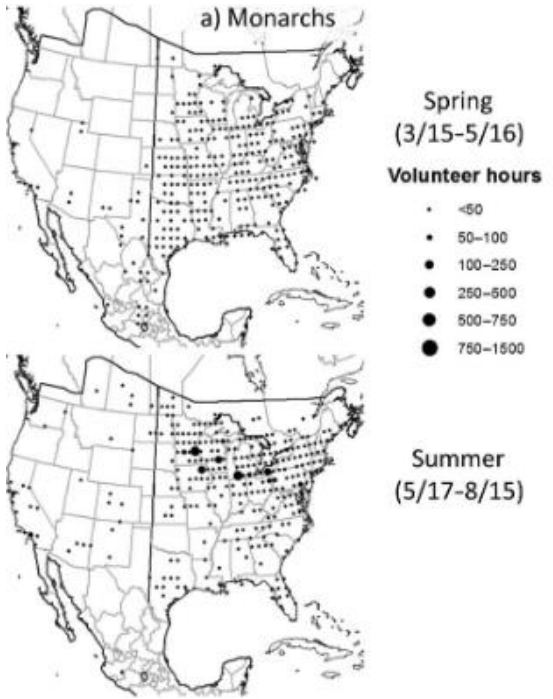
BioScience
American Institute of Biological Sciences

A Citizen Army for Science: Quantifying the Contributions of Citizen Scientists to our Understanding of Monarch Butterfly Biology

Leslie Ries, Karen Oberhauser

BioScience, Volume 65, Issue 4, April 2015, Pages 419–430, https://doi.org/10.1093/biosci/biv011
Published: 30 March 2015





Estimated time spent in 2011 collecting data by volunteers for (a) monarch and (b) general butterfly programs displayed in 1-degree resolution.

The point size is scaled to the number of volunteer hours.

Conservation Biology

Contributed Paper | Open Access

Using citizen science butterfly counts to predict species population trends

Emily B. Dennis, Byron J.T. Morgan, Tom M. Brereton, David B. Roy, Richard Fox

First published: 05 May 2017 | https://doi.org/10.1111/cobi.12956 | Cited by: 15

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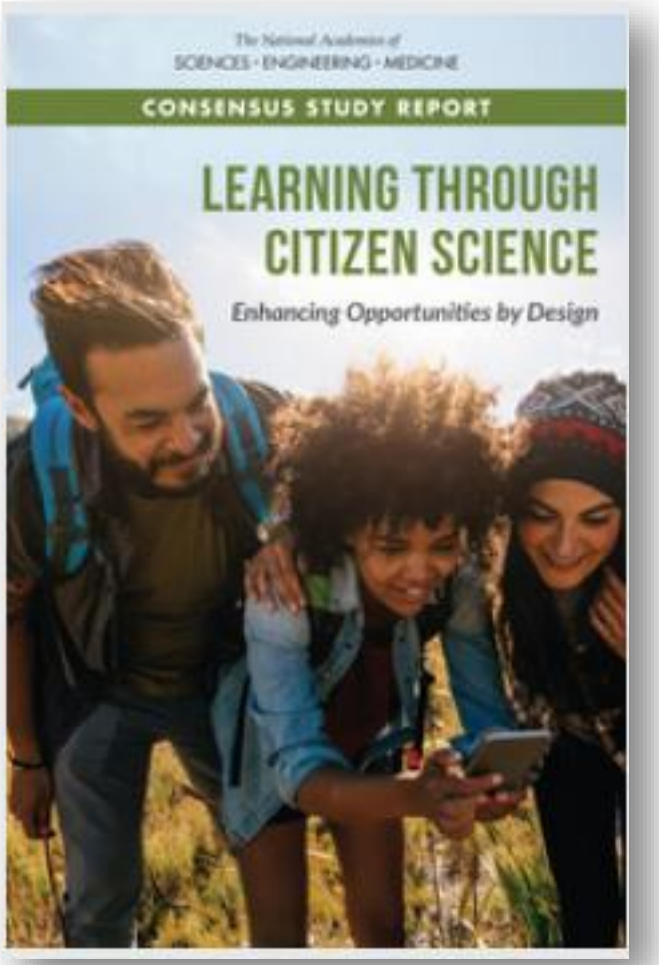

PDF available at http://nap.edu/25183

Common Traits of Citizen Science Projects

- ✓ Actively involve Participants;
- ✓ Engage Participants with Data;
- ✓ Use a Systematic Approach to Producing Reliable Knowledge;
- ✓ Participants are Primarily Not Project-Relevant Scientists;
- ✓ Citizen Science Projects Help Advance Science;
- ✓ Participants in Citizen Science Can Benefit from Participation;
- ✓ Citizen Science Projects Communicate Results.

Advancing science is broadly defined. Citizen science projects meet widely recognized standards of scientific integrity and follow practices common in science. For example, hypotheses and interpretations are rigorously weighed against available evidence – data are not changed, ignored or selectively subsampled to prove a certain idea.

Citizen science projects meet widely recognized standards of scientific integrity and follow practices common in science. For example, hypotheses and interpretations are documenting known phenomenon within a novel context, replicating findings or using science to create a local impact.

"Projects where participants are solely engaged in science communication or science policy but do not have a direct connection to the data generation or analysis and application do not fall under our description of citizen science"

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Our experience: from the museum galleries to the field … and back!

Maremma Natural History Museum

MNHM Citizen Science activities

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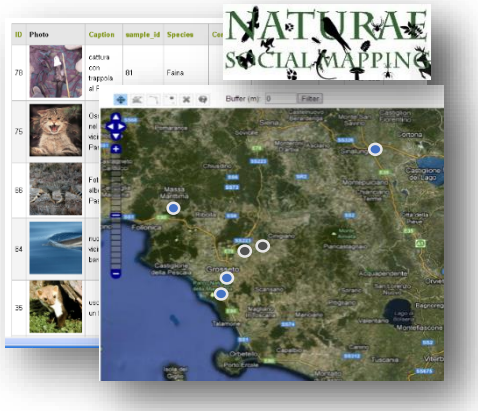
Training courses

Bioblitzes



01 02 03 04 05

Recording site

National surveys

Other projects

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Bioblitzes

Aims:
- raise awareness of biodiversity and the importance of biological recording
- generate a biodiversity inventory for a given site

On average, 30 different surveys were carried out in each BioBlitz; over 1,500 participants contributing over the last 6 years.

About 77,4% participants declared that they are looking forward and ready for the next Bb!

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Examples of activities carried out at our Bioblitzes

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The Italian CS landscape

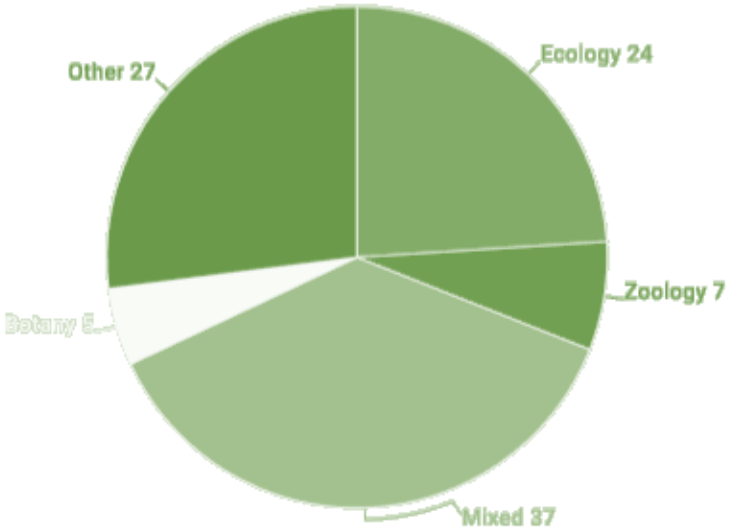
(Bartoccioni et al., 2015)

99 **CS projects**

43 **Stakeholders**

Ministries of environment and research, Universities, scientific museums, CNR, ISPRA, INGV, WWF

104 **Members of CSI**



Other: air quality, seismology, hydrogeological risks, epidemiology, etc.

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A growing, lively interest

UNIVERSITÀ DEGLI STUDI DI TORINO

UNIVERSITÀ DI PARMA

UNIVERSITÀ DEGLI STUDI DI PALERMO

UNIVERSITÀ DI SIENA 1240

UNIVERSITÀ DEGLI STUDI FIRENZE

UNIVERSITÀ DI PISA

ETTORE MAJORANA FOUNDATION AND CENTRE FOR SCIENTIFIC CULTURE

TO PAY A PERMANENT TRIBUTE TO GALILEO GALILEI, FOUNDER OF MODERN SCIENCE AND TO ENRICO FERMI, "THE ITALIAN NAVIGATOR", FATHER OF THE WEAK FORCES

WORLD FEDERATION OF SCIENTISTS
Founded in Erice
Beijing Geneva Moscow New York

X-POLLI:NATION

Associazione Teriologica Italiana

XI CONGRESSO ITALIANO TERIOLOGIA

Museo delle Scienze

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CONSERVAZIONE DELLE LIBELLULE ODV - ODONATA.IT - SOCIETÀ ITALIANA PER LO STUDIO E LA

Sistema Nazionale per la Protezione dell'Ambiente

EU-Citizen.Science

POLLI:BRIGHT

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Building up a citizen science community in Italy

FIRST ITALIAN
CITIZEN SCIENCE
CONFERENCE
ROMA 2017

Consiglio Nazionale delle Ricerche

LifeWatch ITALIA

ACCADEMIA NAZIONALE DELLE SCIENZE DETTA DEI XL 1782

MINISTERO DELL'AMBIENTE E DELLA TUTELA DEL TERRITORIO E DEL MARE

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Toward a citizen science strategy in Italy

Tavola rotonda

"Verso una strategia condivisa per la citizen science in Italia"

5 – 6 Aprile 2018

doing it together science

Report "Toward a shared strategy for citizen science in Italy" (Agnello G., Sforzi A. & A. Berditchevskaia, 2018)

Guidelines for CS in Italy

The guidelines are identified as a "policy brief“: a summary document of the main aspects relevant to the development of the Citizen Science in Italy.

It is intended for Ministries, public bodies and administrations and aims to offer recommendations for a structural recognition of Citizen Science in scientific research processes at national and regional level.

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Guidelines: final recommendations

- ✓ **Integrate Citizen Science into national and regional strategic planning tools**.
- ✓ **Develop Citizen Science strategies in different domains** (e.g. nature conservation, sustainable development, education, cultural heritage, public health, agriculture…).
- ✓ **Adopt a participatory process** for the implementation of the actions described above, drawing inspiration from values of inclusiveness and recognition of existing competences and best practices.
- ✓ **Create opportunities for national funding** to strengthen and support over time the Italian community of Citizen Science, with particular reference to young researchers and allow the development of capacities and infrastructures in line with what is happening in other international contexts.

Verso una strategia nazionale condivisa:
Linee guida per lo sviluppo della Citizen Science in Italia

Sintesi

Riconoscimenti internazionali della Citizen Science

*Linee guida per la Citizen Science in Italia" DITOs Policy Brief #6 - March 2019

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Questions ?

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