Analysing and Interpreting Citizen Science Data

Training workshop report
April 2019

The training is part of activities under the project Citizen Science for Conservation in Africa — CISCA.
Citizen Science for Conservation in Africa:  
A new collaboration for impact

The workshop is the first in a series of activities under the project ‘Citizen Science for conservation in Africa - CISCA’. This new, 3 year collaboration is building the capacity of citizen science community in Africa through workshops in Kenya, and will end in UK with a forum to share developments and opportunities in citizen science. Led by the Tropical Biology Association, it brings together partners from the UK and Africa for the first time.

UK Partners

Lead partner with 20+ years of experience in capacity building in Africa and expertise in ensuring training content is appropriately targeted for maximum and long term impact.

World leader in the capture and analysis of citizen science data.

Has expertise in engaging the general public in many aspects of biodiversity, in training and keeping citizen scientists engaged, and in ensuring biodiversity data collected by non-experts is useful.

African Partners

Leading biodiversity research institute in Kenya, and a leader in citizen science work.

A pioneering citizen science project to map Kenyan birds bringing together the National Museums of Kenya, A Rocha Kenya, Nature Kenya, and the Tropical Biology Association with technical support from the Animal Demographic Unit, University of Cape Town. It’s linked to the African Bird Atlas.

Funding:

This collaboration is funded by the CCI’s Collaborative Fund.

Cambridge Conservation Initiative

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"The experience that I have gained through talks & exercises has improved my perspective towards citizen science. I never thought data collected by non-scientists could have an impact in conservation".

Frank Lihwa, Tanzania

A new cohort of 22 African citizen science managers gained the skills and knowledge they need to analyse and present their citizen science data. The Tropical Biology Association designed the workshop with partners from the UK and Africa to meet the challenge that so many African citizen science managers face; how to analyse and interpret the data their “volunteers” are collecting. For example, producing maps is a very powerful way of showing distributions of priority conservation species and how these have changed over time. This kind of information is urgently needed to inform management and policy actions.

Dr Simon Gillings (British Trust for Ornithology), Dr Rosie Trevelyan (TBA), and Prof. Les Underhill (Animal Demographic Unit of the University of Cape Town) provided the core teaching. They were supported by Mr Anthony Kuria (Kenya Bird Map project and TBA), Dr Colin Jackson (A Rocha Kenya) and Mr David Clarance (Kenya Bird Map project). Participants took part in practical exercises based on their own projects and gained new ideas and techniques from a variety of case studies based on the trainers’ real life experiences and projects. Equally importantly, the participants shared their work enriching the learning experience and inspiring others.

The 5 day workshop was hosted by the National Museums of Kenya in the first half of April 2019.
The need for the workshop

“I’ve been waiting for this opportunity for many years and I couldn’t believe it that I was one of the select few to attend. At Kenya Marine and Fisheries, we have a lot of data but we have not been able to analyse it or understand the distribution of our species. Now I have everything I need to produce useful maps.”

Thomas Kalama, Kenya

In Africa, there is a huge potential to use citizen science for monitoring the continent’s precious biodiversity and point to where action is most urgently needed. Engaging the public to collect data also connects people more closely to nature, so they develop a better understanding of how they can help conserve it. In spite of the burgeoning citizen science projects in Africa, their managers tell us they need skills to analyse and track changes in their data to ensure it guides conservation action and future policy.

The TBA designed the workshop to fill these skills gaps and strengthen links between citizen scientists who rarely get a chance to share their work. The demand was large; over 200 African citizen science managers applied so we could only offer a place to 1 in every 10 applicants. The taxa and topics the applicants work on were also varied covering freshwater quality, invertebrates, plants, fungi, fish, mammals, reptiles and birds.
Sharing experiences across Africa

“I now have enough confidence to go about analysing my Citizen Science data; I have established strong networks with people who are collecting citizen science information”.

Chediel Mrisha, Tanzania

The 22 participants came from 16 institutions and nine African countries, working on elephants, ungulates, birds, plants, fungi, reptiles, dragonflies, dolphins and seahorses. By bringing together such a diversity of experiences, and backgrounds - a characteristic of all TBA training activities - the workshop created an enabling environment for citizen scientists to make contacts, and share ideas that will be useful for their work afterwards.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Institution</th>
<th>Country of origin</th>
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<tbody>
<tr>
<td>Olaniran H. Odountan</td>
<td>CapeBio NGO</td>
<td>Benin</td>
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<tr>
<td>Lucas Pius Rutina</td>
<td>University of Namibia</td>
<td>Botswana</td>
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<td>Lionel Brice Yamb</td>
<td>African Marine Mammal Conservation Organisation</td>
<td>Cameroon</td>
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<td>Cedrick Fogwan Nguedia</td>
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<td>Clara Naomi Cassell</td>
<td>Fauna &amp; Flora International</td>
<td>Liberia</td>
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<td>Kizito Kakule</td>
<td>Congolese Wildlife Conservation Institute</td>
<td>Dem. Rep. of Congo</td>
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<td>Talatu Tende</td>
<td>A. P. Leventis Ornithological Research Institute</td>
<td>Nigeria</td>
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<td>Samuel Tertese Ivande</td>
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<td>Chediel Kazael Mrisha</td>
<td>Tanzania Wildlife Research Institute</td>
<td>Tanzania</td>
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<td>Frank Lihwa Kalambo</td>
<td>Southern Tanzania Elephant Program</td>
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<td>Judith Mirembe</td>
<td>Nature Uganda</td>
<td>Uganda</td>
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<td>Julius Chomba Muriuki</td>
<td>African Conservation Centre</td>
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<td>Thuita Thenya</td>
<td>University of Nairobi</td>
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<td>Mary Kageni</td>
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<td>Mary Nyawira Muchane</td>
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<td>Dominic Kamau Kimani</td>
<td>National Museums of Kenya</td>
<td>Kenya</td>
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<td>Edwin Gichohi</td>
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<td>Laban Ndung’u</td>
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<td>Thomas Kalama Mkare</td>
<td>Kenya Marine &amp; Fisheries Research Institute</td>
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<td>James Mutungu Joshua</td>
<td>Nature Kenya</td>
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<td>Sidney Shema Kamanzi</td>
<td>Kenya Bird Map Project</td>
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<td>Lennox Kitthi Kirao</td>
<td>A Rocha Kenya</td>
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An international mix of participants at the end of the workshop with the TBA Director, Dr Rosie Trevelyan, (far left).
Capacity built

“There were a lot of things I had been unable to figure out for myself so the teaching was very helpful to me. Learning how to do maps has been amazing. I have needed to do this for a long time because I want to show the wildlife densities in the park as well as map where the conflicts are with the local communities. This is important so we can inform where the rangers should spend more effort/time”.

Clara Naomi Cassell, Liberia

The workshop was tailored to fill the skills and knowledge gaps of the participants – which we established via a pre-workshop survey. We followed a step by step learning approach to build participants’ expertise in analysing their own citizen science data, and interpreting and presenting the results. At the same time, participants were able to improve the design of their data collection protocols to ensure their citizen scientists are collecting meaningful data. Learning themes included:

**Analysing citizen science data and producing maps**
Through ten worked practical exercises, participants learnt diverse skills in analysing and presenting citizen science data. The ten exercises covered

- Using R software and writing scripts for specific analyses
- Making maps. Participants learnt how to make and customise maps from their own data. This included how to access shape files, manipulate areas and grids, plot data and integrate environmental and habitat data, and format their results so that it is meaningful to the reader. They also learnt how to use maps to show trends in space and time.
- Data analysis from data exploration to investigating trends and differences (regressions, ANOVA) as well as making graphs of results (e.g. box plots).

**Understanding biases in citizen science data**
This session began with a field excursion to collect citizen science data that formed the basis of later discussions on how to design protocols and how to deal with biases in data. Participants then did a practical exercise that examined the strengths and weaknesses of their own projects and shared ideas on how to deal with biases and gaps in their data.

**Producing results and thinking about impact**
A creative practical exercise allowed participants to test how well the data they are currently collecting will achieve the long-term impacts of their projects. This, combined with peer to peer feedback allowed them to amend their protocols to ensure these would lead to the impact they are ultimately aiming to achieve.
**Learning from case studies**

Case studies provided participants with real life examples from diverse citizen science projects, transferring expertise between different groups and highlighting what has and hasn't worked well. This approach to learning is extremely effective, translating theory into practice and sharing useful approaches that people can adopt.

**Putting it into practice and setting targets**

Participants received one to one feedback from workshop tutors - as well as from fellow participants so that they could learn approaches and tools specific to their own data. By the end of the workshop, everyone had produced some outputs from their work, and they are continuing to share their outputs one month after the course.

The participants set personal targets detailing how they will apply their new skills in their work. As well as sharing them through the network as they achieve each target, they will present them at the next training.

“…there wasn’t any stupid question – the trainers made sure to answer all. I also liked the group exercises which ensured great participation”.

Laban Njoroge, Kenya

Tutorial session: Dr Simon Gillings helps participants with their data.
Feedback from participants

“Attending this workshop was a great experience and it exceeded my expectations. I have learnt skills on analysing and presenting citizen science data so I can improve our policy in Cameroon on marine mammals”.

Lionel Brice Yamb, Cameroon

4.8 Workshop overall

Participants’ rating based on scale 1 = very poor to 5 = excellent

All participants said they are “very likely” to apply the knowledge and ideas gained from the workshop in their citizen science work. 80% of them found the balance between talks and practicals/discussions to be “about right”.

Knowledge levels
Participants’ feedback showed their knowledge of how citizen science databases and atlases work, and their understanding of biases in citizen science data increased as a results of the workshop based on a scale 1 (lowest) to 5 (highest) (see figure below).

On the same scale, the participants also reported increased knowledge and skills in producing maps, and in generating patterns of changes over time from their citizen science data as the figure below shows.
Confidence in data and data collection protocols

The participants came generally confident that they were collecting valid citizen science data and in the most appropriate way, and the workshop helped them cement this.

At the end of the workshop, the participants reported their levels of confidence in ensuring their protocols are the most appropriate for collecting their data at 4.4, and in using what they learnt about analysing and presenting data and applying it in their work at 4.2 (average scores based on a scale of 1 = lowest to 5 = highest).
**Next steps**

“The workshop has laid a good foundation for me to build on by practicing and improving my skills. Keep up the good work”.

Sidney Shema, Kenya/Rwanda

All the participants said they would apply their new knowledge and skills in their work. They also said they would share their new skills with colleagues, which will help the impact go beyond this project, and that will create a lasting legacy in citizen science work in Africa.

The workshop created strong links between the participants with vibrant interactions and sharing on-going through a WhatsApp group created by the TBA. Maintaining these connection is an important in strengthening citizen science work in Africa.
Recognising workshop supporters

The workshop was organised and facilitated by:

**Tropical Biology Association**
- Dr Rosie Trevelyan (RT)
- Mr Anthony Kuria (AK)
- Ms Joy Mukoma (JM)
- Mr Gregory Maina (GM)

With additional input and teaching contributions from:

**British Trust for Ornithology**
- Dr Simon Gillings (SG)

**Animal Demographic Unit, University of Cape Town/Biodiversity and Development Institute**
- Prof. Leslie Underhill (LU)

**National Museums of Kenya**
- Dr Peter Njoroge (PN)
- Dr Henry Ndithia (HN)
- Prof. Mary Gikungu (MG)

**A Rocha Kenya**
- Dr Colin Jackson (CJ)

**M-KOPA SOLAR**
- Mr David Clarance (DC)

We acknowledge the immense contributions of staff of the **Biodiversity and Development Institute** and **A Rocha Kenya**, and additional financial support by the **National Research Fund, Kenya** through the Kenya Bird Map project:
Programme

Monday 8th April 2019
Setting the Scene
- 07:30 Registration: First opportunity for networking and interaction (JM)
- 08:00 Introduction (AK)
- 08:30 About the workshop (RT)
- 08:45 Word from the Kenya Bird Map project (CJ)
- 09:00 Exercise: Participants experiences: What they are doing, how are they doing it and challenges they are facing in citizen science (AK)
- 10:00 Talk: Citizen Science in conservation (RT)

Approaches to Citizen Science
- 11:00 Case Study: African Bird Atlas: Rationale and protocols (LU)
- 11:45 Case Study: A citizen science toolbox for UK birds (SG)
- 12:30 Exercise: Asking questions from Citizen Science data (RT)
- 15:00 Teaching: A workflow from data to products using R. (SG)
- 17:00 Day close

Tuesday 9th April 2019
Statistical methods – with R
- 08:00 Feedback session (RT)
- 08:10 Teaching and practical: Making maps in R. Step by step approach (SG)
- 11:00 Teaching and practical: Tutorials on using R (SG)
- 12:15 Case study: Challenges and pitfalls when using citizen science data (SG)
- 14:00 Q&A session on using R (SG)
- 14:30 Informal session: Top tips on handling data (DC)
- 15:00 Tutorial and case Study: Some results from the Kenya Bird Map project (DC)
- 17:00 Brief: plans for the next day (AK)
- 17:15 Day close

Wednesday 10th April 2019
Statistical methods – dealing with biases
- 08:00 Excursion: outing to City Park – collecting Citizen Science data exercises (AK)
  - Forest degradation monitoring using the KMacho mobile App
  - Bird mapping using the BirdLasser mobile App
- 11:00 Group photo: City Park memorial
  - Return to Museums
- 12:00 Discussion/ brainstorming: Exploring biases in citizen science data (LU)
- 14:00 Practical exercise: Thinking about own project: linking questions with outputs (RT)
- 16:30 Case study: Some results of forest monitoring through citizen science in Kenya and feedback from the day’s forest degradation exercise (T. Thenya)
- 17:00 Day close
Thursday 11th April 2019

Producing outputs and checking variables

08:00 Feedback session (CJ)
08:25 Talk: The Virtual Museum: an African solution (LU)
09:15 Discussion: overview of protocols and challenges (RT)
11:00 Practical: challenges with our protocols, data and data analysis (RT)
12:15 Talk: dealing with gaps in data (LU)
14:00 Practical feedback: using variables in maps and graphs (RT)
14:20 Talk: mapping habitat variables (SG)
15:00 Interactive talk: Getting the most out of data - Science out of the atlas projects in southern Africa (LU)
16:30 Practical: Mapping practical (SG)
17:00 Day close

Friday 12th April 2019

Communicating citizen science data/impacts to decision makers

08:25 Practical: Using regression and Anova in R (SG)
09:00 Tutorial: Other tips in R (SG)
09:30 Talk: Bias and using colour in maps (SG)
10:00 Talk: Advocacy products out of the atlas projects in southern Africa (LU)
11:00 Tutorial/working session: generating outputs (All)
Polishing/producing output: with tutorials on output e.g. maps, draft results (All)
14:00 Tutorial/working session cont’d: generating outputs (All)
15:00 Review on targets: What next (RT)
15:45 Workshop Assessment (AK)
16:30 Closing speech: Making citizen science work for conservation (Prof. Mary Gikungu (MG), Director National Repository and Research at the National Museums of Kenya)
16:30 Closing ceremony: Presenting certificates (MG, RT)
Networking cocktail (All)
17:00 Day close