"Citizen Science Among All" Participatory Bird Monitoring of the Coastal Wetland of the Limarí River, Chile

Paloma Nuñez-Farias, Salvador Velásquez-Contreras, Viviana Ríos-Carmona, Jorge Velásquez-Contreras, María Ester Velásquez-Contreras, José Luis Rojas-Rojas, Bastián Riveros-Flores

Narrative Inquiry in Bioethics, Volume 9, Number 1, Spring 2019, pp. E3-E8 (Article)

Published by Johns Hopkins University Press
DOI: https://doi.org/10.1353/nib.2019.0023

top of Ben Nevis, the highest mountain in the UK (1345m). Remarkably, three people lived at the summit and took detailed weather observations every hour, day and night, throughout the year, experiencing some of the worst weather anywhere in the UK. As the world warms, we expect the frequency of short, heavy rainfall to increase and this data will provide a baseline to help measure any changes. Nearly 4000 people took part and the records were transcribed into data fairly quickly. That particular job done, the work on analyzing it can start.

Other projects are finite and achievable. I am currently helping with one to measure the dazzling array of plumage colouration in birds to gain a better understanding of how and why spectacular animal colouration evolves. Specimens are selected from a museum's bird collections. I am enjoying seeing the range they have. The idea is to pass data on, helping to build a digital legacy of museum collections. This is fine. I would, however, not be keen to play my part if I thought the outcome was going to be used or made available to anyone wishing to sell or make money from our efforts.

Another factor to consider if you are thinking of setting up a project is the range of platforms on which it will be available. The one identifying antibiotic dosages can be accessed on my iPad, so I can sit in bed and classify or sit on a train and do some work on it. Others, by their nature, require a more sophisticated computer system. Millions of people die each year from diseases carried by certain species of mosquitoes. There is a project to enhance a database of sounds to detect disease-carrying mosquitoes on smart-phones. Only approximately 70 (out of over 3500) species of mosquito are able to transmit human malaria so being able to alert users with acoustic monitoring devices is a fine aim. In order to ensure as much accuracy as possible there is an option to complete training classifications but so far there are just under 500 people participating. Having worked through the training clips. I am still unsure that I can accurately identify which clips contain mosquito sounds and find myself resorting to the *not sure* button too often to feel comfortable. I consider my sound system to be pretty good but it needs to be in order to stand a chance of allowing me to decide on the sound clips.

Another project involves the archives of the League of Nations. The aim is to test a combination of crowdsourcing and artificial intelligence for extracting key information about each document in the archives. One of the limitations I encountered in participating here was that when I needed to type in French I did not have immediate easy access to a French keyboard. It is also essential to have several transcriptions of each document because of blurry and missing letters, different sizes of documents, unusual fonts as well as the multiple languages, and thin paper can lead to recto-verso text overlap or bleed-through, confusing for automatic systems. 1041 volunteers have completed 15,137 classifications on 1000 subjects, which are completed for the moment. Altogether about 750,000 pages have been digitized so far and only about a third has been indexed and made available online.

There are a few other projects I return to when I have some time and am in the mood. The problem must be that, from the other side of the process, there are scientists waiting for large volumes of accurate data to enable them to make progress. We citizen scientists can pride ourselves on making a useful contribution. I just hope those investigating ways of curing cancers such as mine, do so in time to keep me going.

"Citizen Science Among All" Participatory Bird Monitoring of the Coastal Wetland of the Limarí River, Chile

Paloma Nuñez-Farias, Salvador Velásquez-Contreras, Viviana Ríos-Carmona, Jorge Velásquez-Contreras, María Ester Velásquez-Contreras, José Luis Rojas-Rojas, and Bastián Riveros-Flores

We are a group of young people interested in the protection of the coastal wetland of the Limarí River, located south of the Atacama Desert in Chile. Since 2016, we have conducted participatory monitoring to analyze the

diversity of wetland birds in the Fray Jorge Biosphere Reserve. The reserve is a habitat for migratory and resident birds of national and international importance. However, this wetland faces constant anthropogenic threats, such as garbage accumulation, vehicle traffic, hunting of native fauna, among other problems. Citizen science has been our tool of choice to generate relevant information about this natural ecosystem, to enjoy and protect the wetland, to co-create strategies to improve human practices in the natural environment. Together with birdwatchers, scientists and naturalists, we have generated a list of 70 bird species for the site, quantifying the seasonal changes in richness and abundance of wetland species. But, the best results have been for each of the team members: during each visit to the wetland, we make new friends, we have a lot of fun, and we learn together about nature. This experience has empowered us to communicate with the inhabitants of the locality and to the state agencies why we should all take care of our coastal wetlands.

The above describes our local treasure, and we want to share the characteristics, acquired learning, and a little of the magic that makes this group unique in order to inform protagonists, students, regulators, and followers of citizen science.

Scientific method and development of critical thinking

This project is led by ordinary people, supported by professionals in the biological sciences. At the beginning of the project we adhered to a predetermined methodology and a question that did not come from the local group. After the first monitoring, we made

the decision to continue because during each field trip we learned more and more about ecology, local biodiversity, and wetland threats, as well as about building a database for the site. This process helped us to understand the scientific method and encouraged us to develop the ability to ask questions and find answers. After collecting years of information, we had to get involved in the systematization and analysis of the data. This has been one of the biggest challenges since there are two years of monitoring, which is equivalent to many data spreadsheets! We had to sort the information, use Excel and learn about ecological concepts, such as abundance and species richness. With the information we have generated, today we can say that the coastal wetland is a dynamic environment, a habitat for waterfowl, migratory from the mountain range and Northern Hemisphere. By paying attention you can listen to the Pidencito (*Laterallus jamaicensis*), a threatened species, and you can see the Andean Gull (*Chroicocephalus serranus*), for which the wetland is home year-round. We are proud of our results and continuously question ourselves about what we want to achieve in the future. We believe that scientific information is valuable, and we see the potential in terms of scientific advances and information from a Biosphere Reserve. However, socio-environmental problems continue to threaten the wetland, and therefore we consider it a priority to work in the field, transferring the results to the local community in friendly formats. These ideas have pushed us to produce simple outreach materials that everyone can understand, such as puzzles, posters, and drawing books, and to conduct various environmental education activities with the children of the neighboring village. This experience has shown us that,

with small daily acts, we can achieve important improvements.

Collaborative learning

For the team, citizen science is not only research for the sake of collecting data. Our collective experience has allowed us to share and involve our peers and families, and to meet new people from different realities and places. We learn to understand more, observe birds, laugh and get to know each other among volunteers. During the years of monitoring, we have made friends who enjoy biodiversity and we are members of a Whatsapp group "Aves del Humedal" in which we share, comment and identify the observations of our environment. We practice equality: all points of view are valid and important, and the process is relevant to reach the goal. We work to strengthen the capacities of the members of the group; for example, the old ones teach the new volunteers, and we continuously train ourselves. During the years of monitoring,

volunteers have been comprised of environmental educators, park rangers, photographers, illustrators and identifiers of birds and biodiversity, and naturalists, and we are always looking for new participants with other skills. These practices and this spirit radiates within the group and are regularly promoted in the local community.

Self-management and governance construction

One of the great challenges has been the continuity of the project over time due to limited economic resources, the necessary transportation of participants, and the distance to the wetland. With a lot of self-management and willingness to maintain continuity, we make great efforts to transport more than ten people to the study area every three months. We gather to work on data analysis, training, and developing environmental education activities with the local inhabitants. Maintaining the program over time has been possible thanks to the empowerment and learning experience that the wetland has offered us. This spirit of collaboration manifests itself every moment, we work from the heart, we co-finance the activities, we share the food at the end of the day, and we encourage each other to improve. These tasks make us continually face ethical problems. We question ourselves in a personal way: will the effort and information that we generate be a real contribution to solve the problems and generate local changes? And will we have the strength to continue over time? These difficulties push us to improve the program, enjoy every moment, act with perseverance and conviction. For example, we are currently forming a working group with public-private institutions for the conservation of the wetland and development of local governance.

Leadership and roles

The group dynamic has been generated thanks to the fact that we acquired roles almost naturally, and we have a transversal, empathetic, humble leader who promotes the spirit of leadership and teaches us to overcome difficult circumstances. He guides us in the tasks, promotes participation to assume and delegate roles, and motivates us to perform small acts to improve our skills. He acts with the motto "Let others shine so that we all shine much brighter." There are volunteers who work in search of resources for continuity and manage what is necessary for logistics. "They work selflessly, providing space for enjoyment, welcoming and motivating for mutual learning." Biodiversity specialists teach about the value of natural heritage and identify the incidental observations of everyday biodiversity: "We love what we know." In addition, many volunteers and friends participate during their available time: "Participate for the sake of enjoyment." The members of the group assume different roles and, almost naturally, if someone cannot fulfill his role (due to obligations, accidents, etc.), another member can replace her or him. We all feel a lot of affection for the group and for each member, permanent and sporadic. We always promote a cordial, inclusive and empathetic atmosphere. We jointly assume the challenges. The fuel that drives us is the simple will to work for our community and the interest in nature and science. We think that teamwork will allow us to reach our farthest goals.

Sustainability and working for future generations

The ecological and cultural value of the coastal wetland motivates us to invest in developing the group and the community and to work for the future generations. We continuously ask ourselves: what is the problem we want to solve; what and whom does it affect; who do we need to associate with; how can we improve the methodology; and what will we do next with the information? The answers to these questions can be found in looking for practical goals and in being patient. We are training new citizen scientists in bird identification and sampling methods, thereby promoting local development. We are currently applying for and managing new projects. We would like to have more resources, scientists and professionals from different areas working full time to systematize

and share information and to work on wetland protection and local development. Having a long-term vision has helped us to better understand our local reality and to generate strategies in the face of difficulties and changes. We believe in the capabilities and abilities of everybody and provide spaces for trust and reflection, as well as for constructive, transparent and transversal dialogue to share the knowledge and experiences of each member.What we have described are the characteristics of a small group. We are less than 20 volunteers who work together towards common goals. The volunteer base may cause challenges for future continuity, but as we value the natural world we have forged this heterogeneous group in the south of the world. We hope to preserve these ideas over time and boost them in future generation to allow those people to enjoy our environment as much as we do.

Citizen Science Improves the Ethics of Foreign Led Research

Joey Hulbert

I often start presentations for youth with a map to point out where I am from. Then, as a clear foreigner, even after three-years of diluting my accent, I ask them: "why did I come to South Africa?" I use my foreign status to emphasize the exceptionalism of the country with particular regard to the biodiversity of the Cape Floristic Region, a global biodiversity hotspot where our project exists. While that connection seems effective, especially for youth who admire western pop culture, the question remains whether I should actually be the one leading these activities and conducting research in South Africa.

Before I could register at the University of Pretoria, the department had to confirm that I would not take the place of a South African. As a PhD student, I receive financial support to cover my costs of living in the form of a bursary. While the confirmation of my place in the university system is almost certainly a question of finances (which are becoming more limited in South Africa), should the university also be concerned whether I am also taking a potential research topic of a South African student?

There are many benefits of international collaboration, but there are also some risks. For example, much of the fun of science is making new discoveries. I usually emphasize to the youth that they may be the first to find a 'new' species in our sample collections together as a form of motivation. However, will my field of science be as fun when every species has been found and described? I have colleagues who travel the world like its a race to describe and name as many fungi or fungus-like organisms as they can. This behavior gets even more ethically shady when searching for internationally regulated pathogens in countries without the capacity to regulate them. But even in my own situation as a PhD student receiving training, am I taking the fun away from a South African down the line? Advancing knowledge is globally important, but some approaches do not benefit local communities.

Ethics are not generally recognized as a motivation to initiate a citizen science project, but training and engaging local communities in scientific discovery can justify research projects led by foreigners. For example, I could have come to South Africa to complete the research I am doing, maybe giving 4–5 presentations to peers each year and having little impact outside of academia, or I could have established a citizen science project to engage local communities in the research. In this sense, citizen science provided an opportunity to conduct the research I was interested in with a more ethical approach as a foreigner.

Cape Citizen Science (http://citsci.co.za/) is a program that we initiated to aid research for my PhD. We are making progress to incorporate multiple projects under its umbrella, but the research has primarily contributed to our pilot project about plant-killing microbes thus far. The program is almost entirely collections based, asking citizens to contribute physical samples or participate in sampling activities, which have aided our research