



VOLUNTEERING IN MONITORING BIRD BEHAVIOR: ACCURACY MATTERS!

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NATHAN

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**THE
MARCHES
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AGES: 13–14

Imagine you have some special strong interest, such as observing birds. Would you expect scientists to be interested in your observations? Well, they may be! Many volunteers help scientists to perform important tasks as part of scientific projects. These volunteers are called citizen scientists. Over the past years, we have invited adults and students to participate in our research projects. In this article, we describe how citizen scientists contributed to our observations of bird behavior by collecting accurate data. We learned that good communication and detailed training sessions can help the volunteers to collect good quality, accurate data that can be used in the study and shared with the wider scientific community. We are confident that both the citizen scientists and the scientists profit from this collaboration and, most importantly, they all have fun doing it!

CITIZEN SCIENTISTS CAN HELP WITH NEW DISCOVERIES

Imagine you are a curious person who loves spending many hours outside watching birds. Maybe you know where some birds of a certain species have their nest. Now imagine that a scientist is interested in the breeding behavior of the same bird species that you are observing. Are you wondering how you can get in touch with the scientist and make new discoveries together? There may be a way for you to join a research project and actively participate in the scientific process! This collaboration between scientists and non-scientists is called **citizen science** and it has become more common over the last few years [1].

Citizen scientists report their observations, carry out measurements, evaluate data, write publications, and often contribute important **local knowledge**. Citizen science benefits both the scientists and the citizen scientists. Scientists gain information in a short time or over large geographical areas when they involve volunteers in their studies. Citizen scientists can actively contribute to the generation of new scientific knowledge and meet with people who have similar interests. Doing science with others is fun [2], however it is necessary for citizen scientists to understand and follow the “rules.” Such rules are part of what is called **good scientific practice** and they make up an essential code of conduct among scientists. Good scientific practice includes having a fair and respectful attitude toward colleagues and research participants. Scientists also pay particular attention to the **accuracy** of the data they collect. Furthermore, scientists (including citizen scientists) must try to communicate clearly, using similar terminology to describe their observations. It is particularly important to teach these rules of conduct to citizen scientists since they do not usually work in research.

In this article, we will explain how we helped citizen scientists to collect accurate data for our research projects.

OUR BIRD STUDIES

At the Konrad Lorenz Research Center in Austria, we are studying the social behavior of three bird species: graylag geese, northern bald ibises, and common ravens (Figure 1). The birds live freely in nature and are individually marked with colored leg bands. These bird populations have been studied at this center for decades, and for almost 10 years, citizen scientists have been helping with our research activities. More than 10,000 citizen scientists have supported our research, including children like you!

In one project, we were interested in finding out if certain birds prefer to hang out together at specific locations within the study area.

CITIZEN SCIENCE

A research approach that involves non-scientists in all steps of the scientific process, from data collection to writing up the results.

LOCAL KNOWLEDGE

The in-depth understanding and awareness that people of a given community have developed about their local environment and the species there.

GOOD SCIENTIFIC PRACTICE

This is the code of conduct for scientists.

ACCURACY

Correctness and consistency of information. High data accuracy allows data collected by different people to be compared.

Figure 1

The species we study include **(A)** the graylag goose; **(B)** the northern bald ibis; and **(C)** the common raven. All our birds are individually marked with colored leg bands, which allow us to identify every bird.

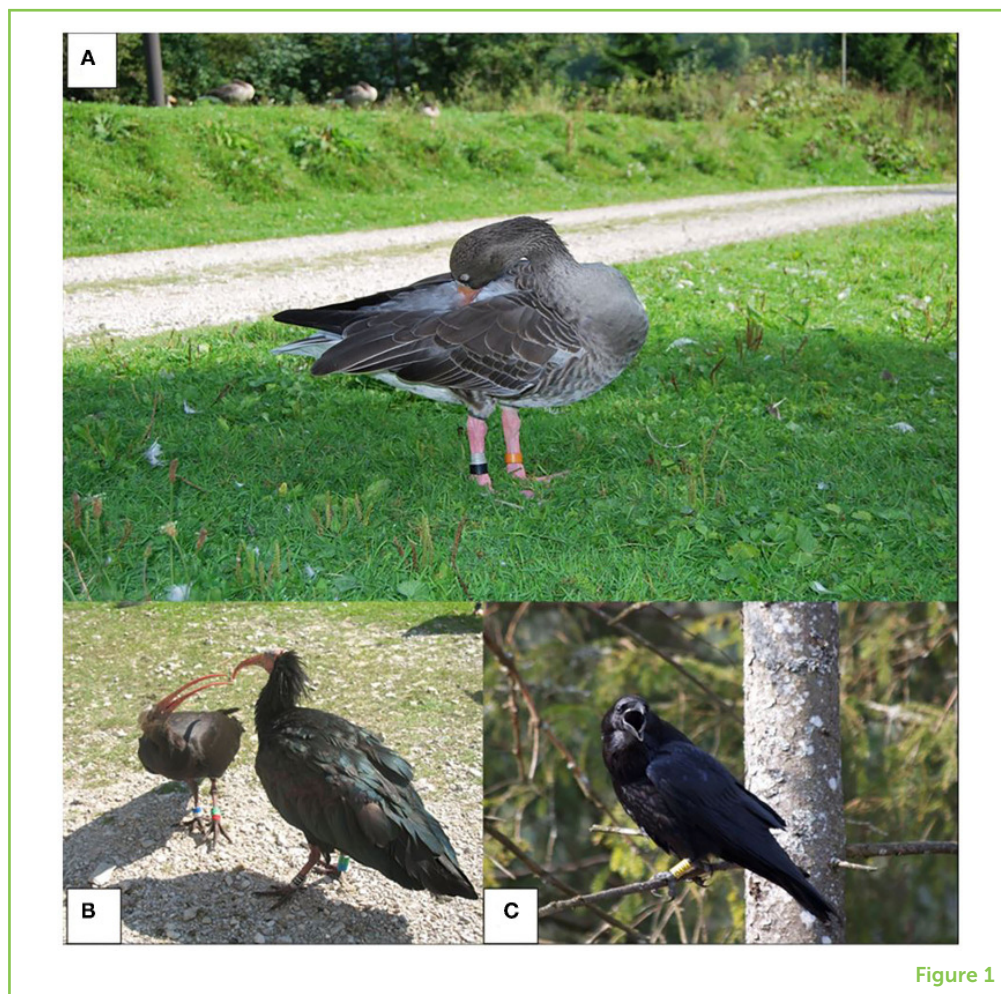


Figure 1

Elementary school students, aged 6–12, recorded bird sightings on a paper form we provided. They wrote down the colors of the leg bands of graylag geese in the study area, as well as the times and locations of the observations. Older students (aged 12–18) and adults used a mobile phone app to collect the same type of data.

In another project, we wanted to know if certain behaviors performed at the nest can affect breeding success, such as hatching of eggs. This is tricky because human observation might disturb the birds. So, we installed cameras at the nests of graylag geese and northern bald ibises and recorded short video sequences.¹ Interested citizen scientists worldwide watched the clips, reported whether the birds were standing or sitting, and identified the behaviors of the birds in the videos.

Sound exciting? It is! However, before involving citizen scientists in these projects, we first had to consider which behaviors to focus on and how to explain bird behavior to non-scientists. This is important for the accuracy of the observations. For example, look at the bird in Figure 2 and describe what you see. One person may say something like, “This bird is in the meadow twisting its neck.” Another may say,

¹ Such video clips are available on the online platform Zooniverse: <https://www.zooniverse.org/projects/spotteron/nestcams>

Figure 2

When working together, researchers and citizen scientists need to agree about what to focus their attention on. Here we show two possible examples for how to describe what the bird in the picture is doing. The more detailed observation on the right provides scientists with important information about the bird species, the colors of the leg bands and their positions on the legs, and the behavior being performed.

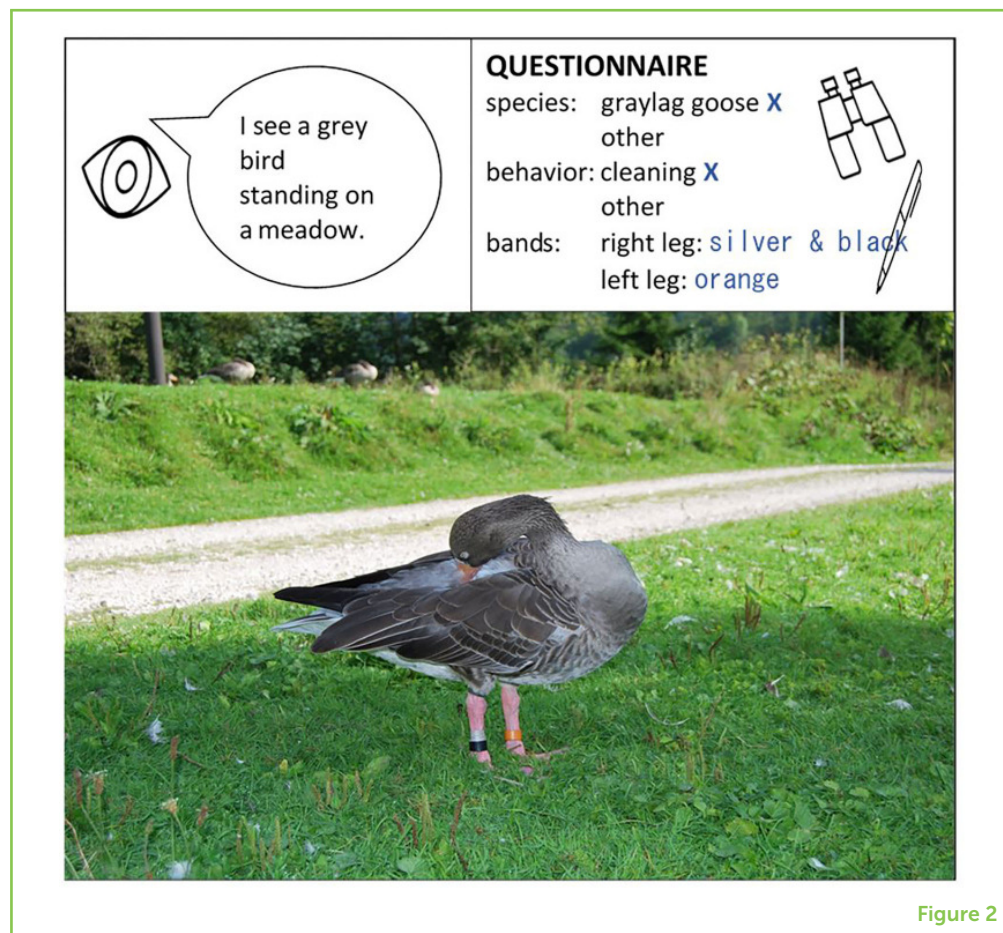


Figure 2

"This bird is a graylag goose cleaning its feathers!" While both of these statements are correct, the second statement is more useful to scientists who are interested in bird behavior.

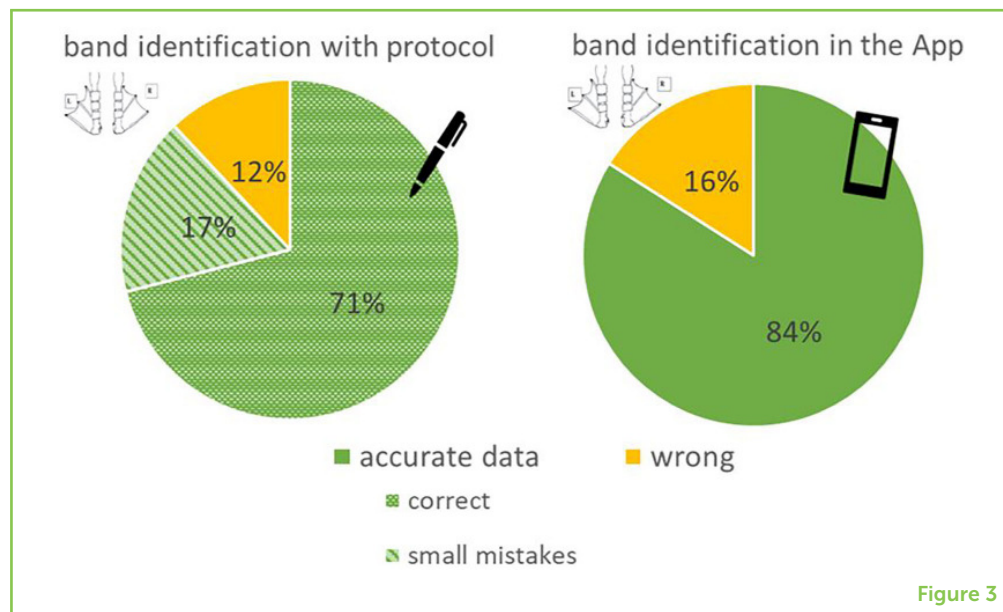
TRAINING STUDENTS AND MEASURING DATA ACCURACY

How did we make sure that the collected data was accurate and useful for our purposes?

First, we knew that the citizen scientists must understand both the research topic and the tasks to be performed. In the case of bird sightings, for instance, we met with elementary school students to explain the research project before they started collecting data. We discussed the important bird behaviors with the volunteers and agreed on consistent terminology. Then, we taught the students how to identify the individual birds and how to enter the data into our form, using geese cut out of cardboard. The training lasted about 3 h, and we repeated it until all the students got it right. Afterwards, the students started collecting data in nature. We expected that all this training prior to data collection would help the volunteers provide us with accurate, valuable data!

Figure 3

The accuracy of data was examined for volunteers using either a written form (left) or a phone app (right) to record the bands on the birds' legs. The percentages of correct band identification were similar in the two approaches (solid green). The so called "small mistakes" on the left were considered useful data. This confirms that our training was successful and that accurate data can be collected by well-trained citizen scientists. When data are accurate, they can be shared with the scientific community.



After data collection, we checked the accuracy of the data. For the bird sightings, the leg bands recorded by the citizen scientists were compared with those in our database, to see whether birds with the recorded band combinations existed in our flock. For the data collected with the app, the entries were checked against uploaded photos to see if the leg bands entered into the app matched the photos. To make sure that data collected from video observations were correct, each video was analyzed by several citizen scientists. If different results were obtained for one video, a scientist took an additional look to identify the correct answer.

LESSONS LEARNED

Data accuracy is essential for scientific excellence, because it allows other researchers to replicate and validate the research. Scientific results are often published in international journals, which leads to further studies performed elsewhere on the planet. Important decisions can also be made based on scientific results, for example on how to manage endangered species.

Our research showed that accurate data can be obtained by well-trained citizen scientists, including elementary school students! The citizen scientists who used the form to collect data reported the data correctly in 71% of cases and made only minor mistakes in 17% of the cases. In sum, 88% of the data were useful for us! When older citizen scientists collected data with the app, 90% of the behavioral observations matched the photos and 84% of the tags were accurate (Figure 3) [3]. This is awesome, don't you think?

In conclusion, we learned that, first and foremost, doing science together should be fun for all participants! It is challenging and fascinating for scientists to interact with volunteers and explain their specific research projects or simply talk about science in general. We think the volunteers benefit, too. They can practice critical thinking and questioning and expand their interests. In our case, participation in our project resulted in longer-lasting knowledge and greater general interest in birds than did regular teaching in the classroom [4].

Citizen science can be a win-win situation for all participants and can ultimately benefit society as a whole [5]. We now know that clear communication between the project team and the citizen scientists is key to collecting useful, accurate data. Are you eager to participate? We are waiting for you!

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YOUNG REVIEWERS

NATHAN, AGE: 15

I am a passionate learner in science, especially in biology. I also love to explore different topics and enrich myself. I wish to become a doctor in the future.



THE MARCHES SCHOOL, AGES: 13–14

We are the Marches School Frontiers for Young Minds Young Reviewers. We are keen scientists who love learning about cutting-edge science discoveries. Our group is made up of students from year 9 who enjoy the challenge and fun that STEM has to offer.

AUTHORS

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Gudrun Gegendorfer is a biologist who is particularly engaged in knowledge transfer. She is involved in citizen science projects involving behavioral research on graylag geese and northern bald ibises. She works at the Konrad Lorenz Research Center, where she supervises the citizen scientists, leads introductory workshops, and supports the participants in their tasks.



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Julia Rittenschober works at the Konrad Lorenz Research Center on citizen science projects with graylag geese and northern bald ibises. She trains the participants and assists them during data collection and analysis. She is in touch with the volunteers



online (project “NestCams”) and virtually on the app, too. She is also involved in data processing and analysis.

**HELENE VESELY**

Helene Vesely is a volunteer who worked at the KLF for a year. Her main tasks were observing bird behaviour, tutoring projects participants and assisting with outreach activities.

**DIDONE FRIGERIO**

Didone Frigerio is a behavioral biologist. She is mainly interested in how social life may influence physiology in group-living birds. She loves to work with graylag geese, even though northern bald ibises have also caught her attention recently. She applies citizen science as a tool to involve students and other volunteers in her behavioral research. *didone.frigerio@univie.ac.at