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Stewardship in Action

Photography and Citizen Science Programs in Protected Areas, Experiences from Central Mexico

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ABSTRACT

Photography is a standard communication method, but there is still a certain reluctance to use it as a research instrument. However, it could be a valuable tool in citizen science projects. In a community monitoring program for conservation, we incorporated long-term photography to record biodiversity. We equipped participants with a semi-professional digital camera and gave training on its use. Over a year, we saw an increase in the use of equipment, governance, and involvement; as for biodiversity, participants were able to record new species, discover new populations, and expand the distribution data of some species.

Index terms: citizen science; community monitors; governance; iNaturalist; Puebla

INTRODUCTION

Citizen science, defined as "the participation of members of the general public in scientific research," has recently increased in popularity to promote environmental awareness and conservation (Bonney et al. 2014). One aspect of citizen science that has been gaining attention is the use of photography in environmental monitoring and documentation (e.g., Luscier et al. 2006; Dorwart et al. 2007; Dumas et al. 2009; Durden et al. 2016). Photography has been used in citizen science projects to document changes in species abundance and distribution and to record human activities' impacts on the environment (Danielsen et al. 2005; Laitila et al. 2016). Furthermore, the change in mobile phones from communication devices to media producers (Scifo 2009) and the development of applications that take advantage of their computing power make them perfect for collecting information for citizen science projects in ecological fields (Teacher et al. 2013). For example, the "Nature's Notebook" program, run by the USA National Phenology Network, encourages citizens to photograph plants and submit the images to a database for use in research on the impacts of climate change on plant phenology (USA National Phenology Network, n.d.). Similarly, the "FrogWatch USA" program, run by the Association of Zoos and Aquariums, trains citizens to document amphibian populations through photography and reporting (Association of Zoos and Aquariums, n.d.).

Photography is an effective tool for citizen science because it allows easy and accurate documentation of biodiversity and environmental change (Danielsen et al. 2005). Its use in citizen science allows for the democratization of data collection, as it is a relatively inexpensive and accessible means of gathering information (Bonney et al. 2014). Additionally, it can serve as a "gateway" to greater engagement and participation in citizen science and conservation efforts (Laitila et al. 2016) by transforming people from passive participants to producers and consumers (prosumers) of scientific content (Olin-Scheller and Wikström 2010). However, there is still a prejudice against the use of photography by non-scientists as a research instrument (Reche 2012). Furthermore, photography raises critical ethical considerations, such as privacy and consent, when photographing people and animals (Danielsen et al. 2005). Therefore, it is essential to implement photography with clear guidelines and protocols to ensure responsible and ethical data collection. The latter has resulted in maintaining photography as a communication tool to promote the "environmental awakening" (Seppänen and Väliverronen 2003).

In this paper, we present our experience implementing photography with a citizen science focus in two different settings—

five communities in a protected area and a school in the region of influence of a protected area in Central Mexico—so managers can include this tool during their interventions. The experiences were part of a training program that included themes in ecology and conservation; for the communities, we had two-and-a-half-hour sessions every two weeks for a year, while for the school, we had interactions every week during the academic period. For the photography sessions, we provided semi-professional digital cameras for the different sessions, which consisted of an introduction to the use of a camera and photography (2 sessions), practice sessions around the different venues (6 sessions), and finally, on the use of Naturalista (iNaturalist, a social platform where participants can upload flora and fauna pictures) (2 sessions).

We worked in the "Cuenca Hidrográfica del Río Necaxa" Protected Area (CHRN) in the Sierra Madre Oriental (SMO), a region characterized by a wide range of ecosystems, such as pine-oak forests and mountain cloud forests (Cerón-Carpio et al. 2012), but some areas have lost up to 80% of the natural vegetation (Evangelista et al. 2010; Ramírez-Bravo and Hernández-Santín 2016). Our intervention involved a group of 16 persons (13 males and 3 females) with an age range of 21–60 y from five communities with different activities: fishermen (7), beekeepers (3), ecotourism (3), and agriculture (3). As people were relatives or worked in the same cooperatives, we provided each group with a semi-professional digital camera. Our protocol allowed participants to take pictures of biodiversity present during their daily activities or of organisms that had a special interest for them to be later identified by the authors or through iNaturalist. Despite having different responses in each community from not using the camera to creating an iNaturalsit account, we noticed an activity increase during sessions using the cameras. In one of the experiences involving a fishermen's cooperative, 10 persons joined while learning about the use of a camera. Other results included the registration of rare and elusive species such as the Neotropical otter (*Lontra longicaudis*), which helped to determine the presence and distribution of different species in the reserve. Some participants changed their perspectives and moved from extractive to ecotourism activities. Further positive impacts included an increase in women's participation, even displacing their husbands when using the camera.

The second experience was in a community in the influence area of the Sierra del Tentzo Protected Area. It has a subhumid temperate climate with rains during the summer, with vegetation mainly composed of grassland, agricultural lands, and patches of tropical dry forest (INEGI 1998). We worked with a school group of 21 children (8 males and 13 females) between 14 and 16 y old who were part of a year-long program to generate ecological promoters within the community. We had the chance to organize a field trip in which parents learned how to use digital cameras and take photographs to record local biodiversity during the programmed field sessions. As part of the experience, children created a profile for iNaturalist in which they registered 300 species of flora and fauna and participated in the different versions of the City Nature Challenge. Also, with the aid of a local company, they generated a visual identification guide for the field site they visited. Some of the changes we could appreciate were increased interest in conservation with two students following studies in careers related to natural resources. Results from species presence have helped to determine which species are distributed in the reserve and in the influence area.

Although we did not track the long-term impact, participants showed more interest in natural resources after our intervention. In the case of communities, two of them started using photographs to register biodiversity and promote their ecotourism on different platforms, modifying their income structure. In the case of the school, the intervention made some students consider keeping up with their studies and choosing a career related to natural resources. Thus, we agree that incorporating photography in citizen science projects is extremely useful, and in the case of ecology-related projects, is becoming increasingly important (Van der Wal et al. 2015; Spear et al. 2017). While there may be some reluctance to use photography as a research tool, it has gained importance in different disciplines, including education, epidemiology, psychology, and tourism (Aanensen et al. 2009; Stephenson 2009; Erdner and Magnusson 2011; Persohn 2015). The principal importance, as we confirmed, is that, as participants become more informed, they can make better decisions about natural resources management (McKinley et al. 2017), while researchers have a more realistic exposure to the evaluated impacts as data is taken on-site (Taylor et al. 1995).

Finally, from our experience using photography, we detected different limitations that need to be considered before planning the interventions: (1) Technological limitations: Most communities lack proper equipment, either digital cameras or phones with enough resolution, or cameras, but it is necessary to consider the different advances in mobile photography technology, which have enabled participants to actively produce and consume scientific content (Scifo 2009; Olin-Scheller and Wikström 2010); (2) Connectivity: Some applications need constant internet access to be able to upload information; (3) Skills and experience: Some identifications or the use of certain applications and equipment need a certain skill set. However, while age and technology experience may initially be barriers, proper training and practice can overcome these barriers (Mullen et al. 2013); (4) Structure: The project needs to have clear instructions indicating roles, duties, and reporting instructions; (5) Communication channels: It is necessary to have a clear and effective communication channel that works both ways, considering available technologies to provide adequate feedback. Also, photography can help to effectively communicate research results to a broader audience compared to specialized journals (Reche 2012); (6) Protocols: From our experiences, we detected three moments based on participants' knowledge, participation, and use of equipment: (a) Equipment and training, (b) Practical, and (c) Appropriation and attitude changes. Thus, it is necessary for proponents to establish and apply well defined protocols during each of the different phases (Mullen et al. 2013; Suprayitno et al. 2017).

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