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Why watch bees? Motivations of citizen science volunteers in the Great Pollinator Project

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ABSTRACT

The benefits of citizen science to conservation, science, and socio-ecological systems as well as to participants themselves are increasingly recognized and valued, yet what motivates volunteers remains little studied and poorly understood. To better understand citizen scientists' motivations and how they benefit from their participation, we surveyed volunteers in the Great Pollinator Project, a conservation-related project in New York City. We conducted pre- and post-season surveys and focus group sessions to find out who the active volunteers were, their reasons for joining, what benefits of participation they experienced, as well as challenges they encountered collecting and submitting data. In comparison with results of several surveys of environmental and conservation volunteers, we found a similar range of motivators. However, while studies of motivations of environmental volunteers have indicated helping the environment as the strongest factor, interest in learning about bees—the subject of the study—was the top motivation of our citizen science volunteers. Helping or contributing to science was the second most cited motivator for participants in the project. Less strong were outdoor/recreation and social factors. We discuss some of the steps we took in response to participants' feedback in order to improve volunteer recruitment and retention. We also make additional recommendations for project design and research to enhance understanding of volunteer motivations, which will benefit volunteers themselves as well as strengthen their contribution to conservation outcomes.

1. Introduction

Citizen science involves volunteers, often non-scientists or non-specialists, in collecting scientific data and participating in other aspects of the scientific process (e.g., proposing research questions, analyzing data, sharing results). This enables scientists to gather more or different data than they would be able to otherwise—on a larger geographic scale and over a longer time period, or from locations such as backyards and other private property (Bonney et al., 2009a; Cohn, 2008; Cooper et al., 2007). The contributions of volunteer-generated data to the body of conservation biology knowledge have been well documented; resulting publications describe trends in species population distributions, seasonal cycles, and implications for environmental and human health (Bonney et al., 2014; Bonney et al., 2009a; Dickinson et al., 2012; Kremen et al., 2011; Schmeller et al., 2009). This suggests critical potential for leveraging data to address complex issues in biodiversity conservation (Theobald et al., 2015). Additionally, participants themselves can gain knowledge and skills in carrying out these processes, including information about species and their habitats, observation and identification, measurements and consistent sampling, among others (Bonney et al., 2009b; Jordan et al., 2011; Nature, 2009). Such personal benefits can, in turn, lead to broader social and environmental benefits in the form of increased input into and support for conservation policies and a motivation to take action beyond the project activity to address related conservation issues (Couvet et al., 2008; Greenwood, 2007; Jordan et al., 2011). As participants work together, they can develop a sense of collective ownership of data, expand their personal networks, and increase their capacity to use results for conservation advocacy and decision-making (Overdevest et al., 2004; Wilderman et al., 2004).

Given such possible benefits to conservation, science, participants, and to socio-ecological systems, it is useful to understand why people seek out and commit to participating in citizen science. As a number of authors note, when volunteers perceive that their motivations for volunteering are matched by the benefits they experience, they are likely to be more satisfied and willing to continue to volunteer (Clary and Snyder, 1999; Jacobson et al., 2012; O'Brien et al., 2008). However, citizen scientists' motivations—their reasons or drives to participate—have been little studied. A functional approach to understanding volunteer motivations proposes that participation in an activity depends on the fulfillment of individuals' motivations (Clary and Snyder, 1999). Further, this approach considers that different people will engage in the same activity to fulfill different motives, and that an individual may

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have multiple motivations that may not neatly be classified as altruistic or egoistic (Clary and Snyder, 1999).

One study that applied this approach to environmental volunteering identified eight motivations common to volunteers at conservation or resource management organizations: helping the environment, values and esteem (i.e., expressions of values and feeling good about oneself), learning, social, career, user (e.g., volunteering at a park or trail the volunteer uses), and getting outside (Bruyere and Rappe, 2007). These findings are consistent with those from similar studies (Ryan et al., 2001; Jacobson et al., 2012) in identifying helping the environment as the strongest motivator, and supporting the notion of social opportunities as a significant predictor of ongoing volunteer commitment, along with project organization (the opportunity to work for a well-run project that uses volunteers' time efficiently). While citizen science may be considered to be under the umbrella of environmental volunteering, in these studies volunteers were primarily engaged in habitat maintenance, restoration, and nature interpretation.

Studies specific to conservation-related citizen science reveal similar motives, though indicating somewhat different results for the strongest motivators. Wright et al.'s (2015) survey of participants in a bird atlas project, in which volunteers collected presence data to provide information on the spatial distribution of bird species, found strong motivations related to values (e.g., a sense of contributing to something worthwhile), the opportunity for recreation and/or to spend time in nature, and learning. Another survey—of volunteers trained for an invasive species identification project—found that learning specific content and skills were important motivators (e.g., plant identification, using GPS units), as was learning about environmental issues, including invasive species and invasive species monitoring. Interest in science was also a reason for participating, but the primary reason for only a few respondents (Crall et al., 2013).

We sought to understand the motivations of volunteers in the Great Pollinator Project (GPP), a conservation-related citizen science project, to better meet their needs and expectations, and to enhance the project by attracting and retaining volunteers. Our aim was twofold: 1) to identify what motivated participants to join the project, and 2) to assess how well the project fulfilled those motivations and contributed to volunteer retention. We describe results of surveys of GPP volunteers and discuss how these correspond with other findings about motivations important to environmental volunteers and citizen scientists. We relate actions we took in response to our findings and reflect on how citizen science coordinators may take motivations into account in project design by matching project activities with volunteer motivations to enhance conservation outcomes.

2. Methods

2.1. Great Pollinator Project

The Great Pollinator Project was initiated in 2007 as a partnership between the Center for Biodiversity and Conservation at the American Museum of Natural History and the New York City (NYC) Department of Parks and Recreation's Greenbelt Native Plant Center. (See Ballard et al., 2016a- this issue, for other museum-sponsored conservation-related citizen science initiatives.) The goals of the project were to improve park management practices to conserve pollinator habitat, to raise awareness of native bees, and to identify which areas in NYC had good pollinator service—as indicated by how quickly bees arrived to pollinate flowers at various locations.

To address the question of pollinator service, project scientists enlisted the help of volunteer "Bee Watchers" to collect data on bee visitation to selected species of native flowers. We recruited volunteers by posting announcements on websites and listservs of city and non-profit organizations, and distributing flyers at greenmarkets, park events, and through citywide events, such as the annual NYC wildflower week. We also received occasional press coverage and radio interviews about the project enabling us to recruit volunteers more widely.

We held volunteer orientation sessions each year during the month of May in each of the five NYC boroughs, where project scientists explained the project goals, provided information and training to enable volunteers to gather accurate data, and distributed the target plants and/or seeds for participants to plant in their home gardens. For those unable to attend an orientation session in person, detailed instructions and training information were also provided on the project website (greatpollinatorproject.org). Participants without a home garden were encouraged to conduct bee observations on target plants growing in the wild or in park gardens throughout the city. From May through October participants recorded five categories of bees landing on one of nine designated plant species. An observation session lasted until five bees had arrived or 30 min had passed, whichever came first. This protocol, developed by the national Great Sunflower Project (www.greatsunflower.org), designated bee categories to be relatively easily recognized by volunteers: honey bee, bumble bee, large carpenter bee, shiny green bee, and "other" type of bee. In addition to that project's focus on the common sunflower, GPP target plants included native perennials (common milkweed, mountain mint, rough-leaved goldenrod, bee balm, woodland sunflower, smooth aster) and others commonly found throughout the five boroughs of NYC (purple coneflower, garden cosmos). Throughout the season, project coordinators stayed in touch with volunteers via email and blog posts to encourage data submission and highlight seasonal observations of interest and other pollinator-related news.

In 2009 and 2010, we conducted pre- and post-season surveys and focus group sessions to better understand the demographics of who was participating; why and how they did so, and what they learned; and to collect feedback about the project. This research was approved by the American Museum of Natural History Institutional Review Board. In this paper we focus on the results relevant to understanding Bee Watchers' motivations.

2.2. Surveys

Pre-season surveys included a question about volunteers' main reason for participating in the project. Post-season surveys asked about benefits of participation as well as challenges they encountered.[1] The surveys were similar in both years with the exception that we changed the motivation question from closed to open ended between years. This change was made due to respondents in 2009 not following ranking instructions correctly, and in order to provide an opportunity for more detailed responses to better assist us in improving the volunteer experience.

Both pre- and post-season surveys included demographic questions (age, gender, race, income, and education level), and the 2010 post-season survey also included a six-item "nature-relatedness" scale as an additional characteristic to describe project volunteers, recognizing, based on 2009 responses, the relatively homogenous demographics of Bee Watchers.[2] Respondents were asked to rate the extent to which they agreed with each statement (Fig. 1), using the scale from 1 (disagree strongly) to 5 (agree strongly).

We surveyed all participants anonymously, comparing the responses of first-time project volunteers to the responses of returning volunteers. Pre-season paper surveys were filled out and collected at orientations at the beginning of the 2009 and 2010 seasons, as well as sent out to people who signed up to be on the project contact list, but did not attend an orientation (in 2009 as an email attachment and in 2010 as a SurveyMonkey® link). In addition to the surveys completed by orientation attendees (74 in 2009 and 78 in 2010), response rates

[1] Motivation and benefit questions were modeled on questions from Cornell Lab of Ornithology surveys for Project Feeder Watch.

[2] "Nature relatedness," including affective, cognitive, and physical aspects, is expected to be relatively stable over time; the six-item scale was developed and validated for embedding in surveys (Nisbet et al., 2009).