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BRIEF COMMUNICATION

Social networks and ornithology studies: an innovative method for rapidly accessing data on conspicuous bird species

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Abstract We developed an innovative method for finding individuals of a conspicuous species in complex urban habitats. The aim of this study was to detect as many burrowing owl nests as possible in order to develop an ecological and behavioral study. We performed an online survey through the social network, Facebook. The results of this survey allowed us to detect and locate 36 new burrowing owl nests. We conclude that developing online surveys through social networks is an innovative and cost-effective method to obtain information about bird locations, and can complement traditional methods such as field surveys.

Keywords *Athene cunicularia* · Urban areas · Bird surveys · Burrowing owl · Social networks · Facebook

Introduction

A variety of different survey methodologies had been developed to improve bird ecology studies (Fair et al. 2010). Traditional sampling techniques used in bird studies include broadcasting calls, as well as foot, aerial and road surveys (Bibby et al. 1992). Using a priori knowledge of the study species, sampling methods can maximize encounter rate by focusing on the most likely occurrence areas (Bibby et al. 1992). Characteristics including body size, activity cycle (i.e., diurnal, crepuscular, nocturnal), habitat use, and flight behavior affect detectability, with the result that some species are much more conspicuous and easier to localize than others (Bibby et al. 1992). A "look and see" approach is

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commonly used to locate individual raptors and/or their nests (Fuller and Mosher 1981). Compared with most other groups of birds, raptors are rare and often widely dispersed; therefore, raptor surveys often require greater effort (personnel and time) than surveys for other birds (Andersen 2007). However, because raptors are conspicuous, especially when they are nesting, people living in close proximity to raptors' nests usually are familiar with nest locations. Information from questionnaires sent to local wildlife managers and bird-watchers have often formed the basis for nest searches (Andersen 2007), and use of this information, in addition to that from historical records, may reduce the time and costs of using other techniques in searching for nests (Fuller and Mosher 1981).

The Internet plays an important role in modern communication: almost all productive human activities are connected or related to this worldwide network. Given that online social networking technologies enable individuals to simultaneously share information with any number of peers (López 2012), an interesting question is how these new technologies might be utilized to complement ornithological field work. There are many social networks worldwide; Facebook is one of the most popular with over 734, 2 million people in the world by 2011 using the service (Ferrandino 2012). Facebook users are connected to a local network of individual "friends". Personal posts appear in chronological order and become visible to friends of friends in the news feed feature when someone comments on or shares a post. Three main possible mechanisms may explain diffusion-like phenomena on Facebook: (1) an individual shares a link on Facebook, and exposure to this information causes a friend to re-share that same link; (2) friends visit the same web page and share a link to that web page on Facebook, independently of one another; and (3) an individual shares a link with a friend outside of Facebook, and exposure to the externally shared information causes the friend to share the link on Facebook (Bakshy et al. 2012). Due to these characteristics, and its broad utilization in society, we hypothesized that Facebook could be a useful way to gather information about conspicuous birds' locations relatively quickly and across large study areas. Here, we investigated the usefulness of Facebook as a tool for detecting burrowing owl (*Athene cunicularia*, Strigidae) individuals and nests in the city of Mar Del Plata, Argentina. The burrowing owl is a raptor that can be found across North and South American open landscapes such as native grasslands, agroecosystems and vacant lots in towns, urban and periruban areas (Conway et al. 2006; Pedrana et al. 2008). Burrowing owls show both diurnal and nocturnal activity, and nest either in burrows excavated by the owls or in abandoned caves excavated by fossorial mammals. Pairs are territorial and highly conspicuous in the daylight, being easily located usually within 30 m of their nests (del Hoyo et al. 1994). The aim of our study was to assess the power of Facebook as a tool for detecting burrowing owl individuals and nests in urban and periurban habitat.

Methodology

In 2012, we conducted an online survey in order to detect burrowing owl nest locations in urban and periurban areas of Mar Del Plata, Argentina. Mar del Plata (38° 0′ 12″ S - 57° 33′ 10″ O) is a city located on the southeastern coast of Buenos Aires Province, with a population of 618,989 inhabitants and an urban area occupying 79.48 Km^2 (INDEC 2010). The survey consisted of two posts, one in May and a second one in September. The post made in May (Fig. 1) was made at 4:42 PM on the wall of MC's Facebook account (https://www.facebook.com/photo.php?fbid=10151679697355427&set=a.212998970426.286925.704885426&type=3&theater); MC Facebook account has 555 friends from whom 60 %

are males and 40 % females. Of MC's 555 friends, 80.8 % live in Argentina, and 27.92 % of these Argentinean friends live in the area of interest. The average age of MC's friends is 31.9 ± 0.71 years old. The information posted on MC's account was public, meaning that anyone could see the post, share it and comment on it. In order to control for the identity of the account owner, we created a Facebook account in May 2012 that provided information about burrowing owls and the research work being performed, but did not belong to an identifiable individual [Lechucitas Vizcacheras (Spanish name for burrowing owls): https://www.facebook.com/lechucitas.vizcacheras]. On September 2012 at 10:14 PM, a post (Fig. 2) was made from 'Lechucita Vizcacheras' Facebook account (hereafter LV: https://www.facebook.com/photo.php?fbid=162676353870111&set=a.101056110032136.1544.100003832413578&type=3&theater). The LV Facebook account has 301 friends of which 41.1 % are males and 59.9 % are females. Of these 301 friends, 96.4 % live in Argentina and 53.15 % live around the area of interest. The average age of LV's friends is 33.7 ± 0.9 years old. In both Facebook posts, we asked for burrowing owl locations in the city of Mar del Plata (Argentina) and surroundings.

After making each post, we tagged friends in the image so they would receive a notification and a wall post linking them to our post. Tagging facilitates connection with more people and multiplies the scope of the search. Images were public to ensure that a greater number of people could see them. We assessed the number of times each post we made was shared, and we listed all comments and private messages received in answer to the request by the date of each comment. For each report we received, we visited the place the sender mentioned having seen burrowing owls and checked for presence or absence of this species; we then classified each comment as true or false. The percentage of true versus false reports given through the Facebook account was calculated as the number of true or false reports divided by the total number of reports for both posts.

Speed of response was assessed by counting the number of comments and messages that were made on the same day the post was made (≤1 day), on the second and the third day after posting (2–3 days) and after the fourth day (≥4 days). The number of comments that were received one, two, three and four hours after the postings were made were counted during the first day of posting. We took into account the identity of responders, and evaluated whether people who provided information for the first posting were the same as those providing information for the second posting.

Results

The postings received a total of 73 comments and messages, of which 56 provided information about burrowing owl location. Out of these messages and comments, trivial messages not intended to be informative were discarded (11 messages). The Facebook post published at MC's account in May was shared on Facebook 16 times by 15 of MC's Facebook friends and one non friend. This posting received 36 comments and messages about burrowing owl locations around Mar del Plata, of which 30 were informative and six were trivial messages. The post published on September on the LV Facebook account was shared 40 times: 22 times by LV's friends, eight times by non-friends, seven times by LV itself, and three times by MC. This posting received 37 messages and comments, of which 26 comments and six private messages were informative and five were trivial messages. A total of 15 of LV's friends and 11 non-friends provided informative messages.

We located 36 burrowing owl nest sites using information provided in the responses to our Facebook posts. We located 19 of these nests after the May posting and 17 new nests

Fig. 1 Posting made on MC's Facebook account on May 10th at 16:42 PM in order to perform an online survey for this species. Translated from the Spanish: "We are searching for burrowing owls in Mar del Plata and surroundings! We are performing research concerning this species in urban sites. If you have seen any contact us at acunicularia@yahoo.com.ar". Photograph by Nicolas Chiaradia

Fig. 2 Posting made on the Lechucitas Vizcacheras Facebook account on September 30th at 10:14 PM in order to perform an online survey for this species. Translated from the Spanish: "We are still searching for burrowing owls in Mar del Plata and surroundings!!! We are performing research concerning this species in urban areas. If you want to collaborate with us tell us if you have seen any and where you have seen them. Contact us at acunicularia@yahoo.com.ar, or via Facebook at Lechucitas Vizcacheras. Thank you!!!" Photograph by Nicolas Chiaradia

after the September posting. After verifying the veracity of the information in the responses, we classified comments and messages as true or false. A high percentage of responses to our postings were true: 90 % of responses to the May posting and 65.6 % of responses to the September postings led to nest locations. People who provided information about burrowing owl locations after the first posting did not repeat their information for the second posting, with the exception of one case in which the same person provided the same information in both surveys. The same location for a burrowing owl nest was mentioned in eight responses to the May posting and in four responses to the September posting. Responses to our May and September postings contained different information for the most part: only 2 nests were reported in both surveys.

The majority of comments and messages in response to MC's posting were received on the day of posting, and the peak of the response was immediately after posting (Fig. 3a, b). In less than 1 h, we had received the bulk of reports providing information about burrowing owl locations. No comments and messages were received on the third day, but 13.3 % of reports were received after the fourth day of the May posting (Fig. 3a). We received the bulk of information in response to the September posting during the first day of posting, but continued to receive burrowing owl location reports some days after the post was made (Fig. 3).

Discussion

Online social networks have become a popular way to share and disseminate information. Their massive popularity has led to applications ranging from marketing techniques that attempt to spread content, products, and ideas on these sites (Cha et al. 2009) to recreational uses such as sharing pictures with friends, playing games, talking to friends or exchanging opinions (Ellison et al. 2007). Online social networking technologies enable people to simultaneously share information with any number of peers (Bakshy et al. 2012). Likewise, users can take advantage of a variety of social networks sites to interact with other users. Facebook is one of the most important social networks worldwide (Ferrandino 2012). Facebook is available on many mobile devices and allows users to continuously stay in touch with friends, relatives and other acquaintances as long as they have access to the Internet.

In this study, we assessed the effectiveness of Facebook as a tool to locate burrowing owl nests, with rapid and positive results. In less than 3 days after each Facebook posting was made, we had received the majority of nest location reports (83.9 ± 3.6 %). A field survey to find burrowing owl nests in our urban study area would have demanded a time-intensive sampling effort and higher costs (Conway et al. 2007, Crowe and Longshore 2010). Our study demonstrates that performing online surveys on Facebook is a useful and innovative way to detect conspicuous birds, especially for bird species that inhabit urban habitats in which the view area of researchers is limited due to buildings. Using Facebook as a survey tool helped us reduce searching time in the field and reduced the fuel expenses involved in traditional nest searching. The cost of checking for false reports was low, because fewer than 22.5 % of all the reports we received (considering all informative messages) did not lead to burrowing owl nest locations. These points are especially salient given that research funds and time are usually limited.

The fact that the bulk of comments and messages were received within the first hours after posting shows the high speed at which information can be obtained through this social network. This may be due to the fact that Facebook uses a story bumping algorithm that

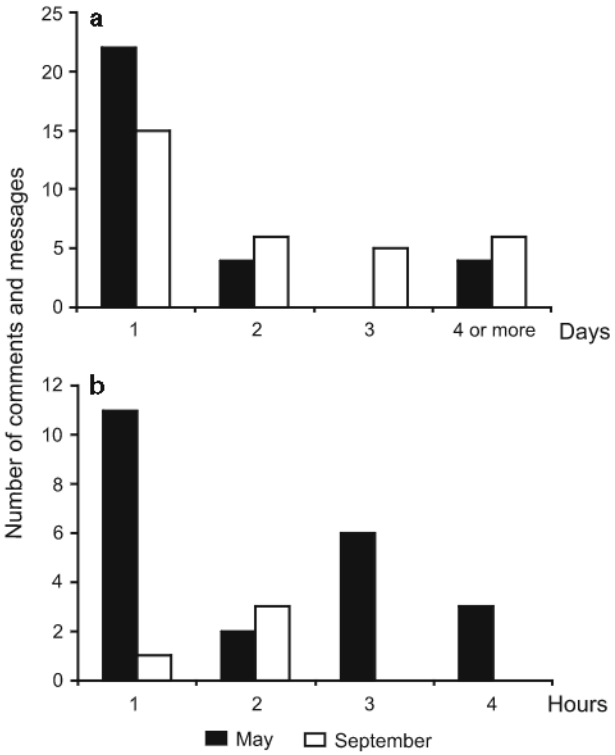

Fig. 3 Number of comments and messages received after postings made at Facebook accounts in May and in September; **a** number of messages and comments received on the same day and days after the posting was made, **b** received hours after posting

brings the most popular post to the top of the news feed, affecting its exposure; it is thus predictable that the first hours after a post is made will be the ones in which the post receives the most attention.

Several factors should be taken into account when attempting to obtain information about nest or individual bird locations from social networks. For example, while time of year was relatively unimportant for our study, because South American burrowing owls are highly conspicuous and remain close to their nest year-round (König et al. 1999), the extent to which Facebook surveys increase detection probability in other bird species may vary across seasons or stages of the breeding cycle. The time of the day at which the post is made is also crucial, because the number of friends that are online (and thus can see the post) may vary throughout the day. We found a different pattern of response between the posting made during the afternoon (May: 4:42 PM) and the one made at night (September: 10:14 PM). Even though valuable information was obtained from both postings, the speed of response after the night post was lower than that for the afternoon post.

A number of recommendations should be taken into account in order to optimize the performance of this innovative method to obtain species location information. Post should be shared at friendly wildlife local fan pages to increase the likelihood that people interested in wildlife see the posts. Another alternative to reach more interested people is to create a Facebook fan page. Even though Facebook fan pages are designed mostly for businesses, they offer benefits such as an unlimited number of likes (fans), access through web searching engines, tracking of the number of views a post receives, and statistics (reached through Facebook Insights). Tools associated with fan pages are useful for

quantifying the reach of a message and who the audience is. However, fan pages do not allow owners to connect with other users by adding them or viewing their profiles: the relationship is strictly one-sided. In contrast, personal profiles allow easier connection with others; for example, friends can be added to make new connections rather than waiting to be added. Personal profiles allow users to interact more directly with their connections. We used a personal profile in our surveys, and found that it was useful in obtaining information about burrowing owl nest locations.

This tool is especially useful when the goal is to detect a specific number of conspicuous individual birds or nests in well-populated areas, requirements common to behavioral or reproductive biology studies. However when questions are about bird abundance and density, this tool can present important biases. While this tool can complement field work and reduce the economic or time costs of searching for nests or individuals, it cannot replace traditional methods.

The success of our online survey may be related to rising visibility of activities related to wildlife conservation in Argentina. The increasing number of groups (e.g., bird watching groups and non-governmental organizations) involved in environmental and conservation activities is having a great impact on society. Through public awareness campaigns, including educational talks at schools and neighborhood meetings, these groups help people to get involved and increase their environmental sensitivity. Ultimately, environmental awareness may not only increase public understanding of local flora and fauna, but also encourage citizen scientists to provide information for scientific purposes.

Even though social networks had been used for many conservation and environmental educational purposes, to our knowledge it is the first time that Facebook had been used to access wildlife data in order to perform an ecological study. Our study, in which Facebook postings led directly to the discovery of 36 new burrowing owl nest locations, convincingly demonstrates the data collection potential of social networks.

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