Moving Past Qualitative Data to Quantitative Data

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Birders produce many types of lists. All of the following lists already have a quantitative component that, when reported, produce quantifiable data for researchers.

Christmas Bird Counts	eBird Counts
Big Day Counts	Project Feeder Watch or The Big Sit
Breeding Bird Surveys	Breeding Bird Censuses
Hawk Migration Watches	Breeding Bird Atlases
MAPS + Point Counts	Mist Net Surveys
Raptor Surveys	Shorebird Surveys

Tricolored Blackbird and other species-specific Surveys

These surveys and lists are instrumental to scientists in identifying population trends, species densities, migration timing, reproductive success, and habitat that may be critical or limiting. If you are not including numbers of individuals observed (i.e. reporting occurrence only), then you are not recording as much information as you could. In addition, documenting even more quantities than just the numbers of each species, including by age class or sex, effort (minutes, hours, or days), the quantity of habitat, and the number of observers, all can make the data more valuable.

Quantifying observations can provide many benefits. Numerical data allow determination of rates of change in numbers and even how fast those rates are changing. Determining those rates may allow us to objectively evaluate and prioritize conservation options and assess the efficacy of management actions.

People look at birds for many reasons. Many enjoy just being out of doors. Some enjoy the challenge of locating and identifying rare species or species that they have not seen before. Some want to find more species than other birders. Some enjoy sharing the love of nature with others. Some seek to teach natural history to others, so they are more likely to care about the well-being of the natural world.

Here, I will promote an opportunity that some of us may be missing—to be better citizen scientists. We can improve on the quality of data that we are collecting. The first step in this effort is to recognize the limitations of qualitative data.

QUALITATIVE IS NOT SYNONYMOUS WITH QUALITY

An example of a qualitative assessment is whether something is black or white. If you have ever tried to buy paint or develop your own photographs, however, you understand that there are hundreds of shades of black and white and gray shades in between. How black and how white something is, is a measure of reflectance, pigment density, or the component light wavelengths and their relative intensities. Whether something is black or white is a poor starting place, but we have to start somewhere when we collect data, so we often start with a qualitative description. How do we improve our data? We measure it. The best-quality data is quantitative and qualitative. Participants in the various birding activities can contribute more to scientific knowledge if they add quantitative data to their observations.

Many of us are listers and document unusual bird sightings. These observations are important data, especially when we realize how difficult it is to determine that something is absent. A record of presence or absence is qualitative but it leaves much statistical ground in between. Non-detection may result from true absence or from non-detection due to low density, inefficient or inappropriate methods (e.g., diurnal birding for owls). These distinctions—from low density, to low effort, to absence—are not addressed by qualitative data collection.

By quantifying the effort, such as the number of hours and minutes spent birding, miles driven or walked, mist-net-hours, or years since last observed, the data can be normalized (i.e., made comparable) to assess differences in abundance or frequency of occurrence among sites or based on trends over time. Many birders already collect quantitative data. Their efforts can "count" for more simply by standardizing the presentation of numbers, consistently using significant figures (Kajrys and Fulton 2019), and providing information that allows calculations of abundance per unit of distance, area, and time. Standard units can make the results of different studies easier to compare based on number of, or rates of change in birds per transect mile, acre, or hour, or by other parameters. By adding quantitative elements to our qualitative day-list data, we provide better and more useful information, and thus contribute much more as citizen scientists.

RESPONSES TO FREQUENTLY ASKED QUESTIONS

There are many issues regarding quantification of bird observations. Many are beyond our scope here but may be of interest to birders. Some of these issues include counting protocols, eBird counts as part of the CBC data compilation process, counting methods, and distinction between surveys and indices. Here are just a few of the most common questions and some responses.

What is the Role of eBird?

eBird records quantitative data submitted using standard procedures for each visit to each separate location. In addition to numbers of birds, eBird encourages birders to report time spent birding and distance travelled, which allows data to be normalized (i.e., expressed as birds/hr or birds/mi). eBird archives that numerical data for future use by researchers and birders. See article by Devine and Fulton (2019) for more information on eBird.

Should I Guess? If I Didn't Make an Actual Count, Should I Enter an X in eBird or an Imprecise Estimate?

Counting the birds you see and reporting that count is best practice, of course. Absent a count, however, go ahead and guess an estimated number. Your estimate provides more information than recording "present", and thus is better than no guess at all. If you cannot count because the time is too short, then calculate the number based upon time and/or area, or estimate based upon numerical images that you personally calibrate for each order of magnitude, or if none of that is possible, then guess. You are, after all, the best expert on what you actually saw, so describe it and explain how you arrived at your reported number. See the related articles by Fulton and Kajrys (2019) and Kajrys and Fulton (2019) for more information on counting and reporting counts.

Perhaps the only circumstances when reporting an "X" (i.e., presence) is warranted is where you know a bird was present but have no idea of the number. Examples of this situation include flocks of geese that fly over above cloud level or in the dark, or when you hear a call from a bird that typically occurs in flocks (i.e., magpies) but you don't see the flock.

How Do I Estimate Large Flock Sizes?

Counting large flocks is addressed in detail by Fulton and Kajrys (2019). Several key points follow. Practice is needed and effective in learning to accurately count large flocks. Several different techniques are useful for estimating or calculating large flocks. Timed-sample counts, transects, density, and area extrapolation methods are all helpful in different specific situations.

Should eBird Become the Preferred Way to Submit CBC Area Data to Compilers and Count Data to the National Audubon Society?

Currently, there is no standard procedure to integrate eBird count data into CBC counts. One issue is that eBird attempts to record bird numbers for specific locations and in designated habitat types. CBC count areas typically include multiple existing or potential eBird locations and multiple habitats. Of course, CBC counters can keep their totals for individual locations within their

assigned areas. They can then add the numbers from each to report, subtract out any birds that were likely to be observed more than once in different locations, and report their territory totals to the CBC compiler. This approach fulfills the need of both systems. *S*ome CBC compilers accept direct submission of eBird data as CBC reports. Check with your CBC compiler for specifics for your count.

DISCUSSION

It has been strongly suggested that, as citizen scientists, we should try to do the best we can at collecting quantitative data (eBird 2019). Whenever possible try to get an accurate actual count and note that it is in fact an actual count. Otherwise it will be assumed that it is your best guess or estimate. Allowing the use of the "X" entered into the number field of eBird in lieu of an actual numerical entry was primarily a concession to allow incorporation of historical data that lacked numbers (eBird 2019). eBird wants birders to avoid using Xs in checklists and to always count or estimate numbers.

Checklists that have numbers for all species encountered are more valuable to researchers than those that contain all Xs, or even a mixture of Xs and numbers. When making an estimate or a guess, the level of uncertainty can be explained by a narrative or simply by using proper mathematical notations. Significant figures or engineering notation, as explained by Kajrys and Fulton (2019), can depict the precision of the counting method used. For a guess, it is easy to just add a narrative note or just state your level of confidence, such as +/- 5, or +/- 10, or indicating an order of magnitude (X 10). In this way, your notation tells future researchers precisely how much faith you have in your numbers.

So, make your best conservative estimate. We rarely make exact counts of every flock of every species. Researchers know this and adjust their models accordingly.

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Mountain Plovers (*Charadrius montanus*). 20 November 2012. Solano Co., California. *Photo © Daniel L. Brown*