Best practices for data collection in studies of bird-window collisions

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Data collected by researchers and volunteer-led monitoring programs has been exceptionally important for improving our understanding of bird-window collision mortality. However, after compiling and analyzing data from dozens of these researchers and monitoring programs, we have identified several common pitfalls that limit the applicability of these data to large-scale studies like the Smithsonian/Oklahoma State University anthropogenic mortality project. The following adjustments will ensure that your efforts (1) more accurately document local window collision mortality and (2) better inform large-scale research studies.

Standardization of monitoring protocols and increasing the rigor of data collection and recording will allow seamless collating of data sets to answer questions about window collisions at a continental level. These questions include: How many birds are killed by window collisions in the U.S. each year? How do mortality rates differ among types of buildings? How does mortality differ among regions and seasons? What building characteristics contribute to high and low fatality rates? Which species are most vulnerable to collisions?

Although it may seem like a large task, collecting and recording the information described below can be simply done with basic computer programs. An example of a flexible Google Forms user-interface for data entry can be found here; this portal allows multiple users (or just the project coordinator) to access the submission system, for data to be entered using pull-down menus (thereby reducing data entry errors), and for fields in menus to be customized (e.g. lists of species for users to choose from). This data entry interface can link to an automatically populating spreadsheet. A tutorial for creating such an interface is found here.

Best Practices:

1. **Randomly select the buildings to be sampled (for at least a subset of the study).**

   Why? Monitoring of "problem" buildings is crucial for highlighting the issue of bird-window collisions and for bringing about changes to reduce exceptionally high collision rates at these buildings. However, focusing ONLY on buildings known to cause substantial mortality gives an unbalanced picture of bird-window collision mortality. It is okay to monitor known bird-killing buildings, but also choose a randomly selected set of buildings to monitor. Then indicate for each fatality record whether the bird was found at a "random" building or a "non-random" building. This step will allow mortality data to be more reliably extrapolated to larger scales while still fully documenting the full range of collision rates.

2. **Record the number of birds found for ALL surveys – even those with no fatalities found.**

   Why? If surveys with "zero-counts" are not recorded, it is not possible to know whether searches were conducted and no birds were found *or* if no searches were conducted that day. This uncertainty makes it difficult to accurately estimate mortality rates and to compare data among studies and time periods.

3. **Record the amount of time spent searching for each surveyor during every survey.**

   Why? Person-hours of survey effort vary among monitoring programs, from day-to-day, and from year-to-year. In general, more person-hours of surveying results in more dead birds found. Recording daily

person-hours allows accurate comparison of results within studies (different days and years), among studies, and to improved precision of national mortality estimates.

4. **Record the final disposition of each bird found (e.g. dead, severely injured, injured but flew away, taken to rehab center and recovered, taken to rehab center and died)**

   Why? This information provides a better understanding of what percentage of collision victims die, and it allows more accurate mortality estimation than if records have unknown an disposition.

5. **Record incidental records (those found outside of scheduled surveys or turned in by cleaning crews or the public) separately from records found during scheduled surveys.**

   Why? Incidental reports come from outside of official survey periods, so it is not possible to correct them for survey effort (#3 above). Including incidental records in overall mortality counts leads to inaccurate mortality estimates. Incidental records can still be accepted and recorded, but they should be recorded as such in a "found on survey/found incidentally" column.

6. **Record numbers of buildings & building facades sampled (if variable, record each day)**

   Why? Per building annual mortality rates are the crux of national mortality estimates and comparisons among studies. In general, surveying more buildings results in more dead birds found. Adjusting fatality counts by the number of buildings and/or facades sampled is another way to account for variable survey effort and to increase comparability of results among studies.

7. **Record information about the buildings sampled (including those with zero counts)**

   Why? Reducing bird mortality associated with window collisions requires researchers to identify why some buildings kill many birds and others kill few or none. Information to record can include building height, number of stories, orientation of facades relative to cardinal directions, area of glass, type of glass (e.g. tinted or clear), presence, density, and/or height of vegetation, and whether the building turns lights off at night. Combining building characteristics with mortality data allows identification of factors contributing to high mortality rates and to design recommendations that will reduce bird collision rates.

8. **Record the street address of each building surveyed (including those with zero counts)**

   Why? Even if your study is unable to record specific building information (#7 above), accurate address information allows other researchers to return to buildings to collect this information or to view buildings remotely (e.g. on Google Earth). Pay particular attention to avoiding multiple addresses or building names that refer to the same building and to note buildings separately when one street address includes more than one building.

9. **If possible, expand the survey to include a variety of building types, including individual residences and low-rise buildings (buildings larger than individual residences but smaller than sky-scrapers)**

   Why? We know that high-rise buildings cause many bird fatalities. However, we know much less about how many birds are killed by colliding with individual residences and low-rise buildings. For example: Do birds collide with freestanding homes as frequently as they collide with low-rise and high-rise buildings? Do mortality rates vary by building type or height? Answering these and other questions is crucial for developing design recommendations for a wide variety of building types.