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Les G Underhill & Michael Brooks

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PROJECT REPORT

THE BIRDMAP PROTOCOL: BIRD ATLASING IN AFRICA IN REGIONS WHERE THE OBSERVER NETWORK IS THIN

Les G Underhill & Michael Brooks

Animal Demography Unit, Department of Biological Sciences, University of Cape Town, Rondebosch 7701, South Africa

Email: les.underhill@uct.ac.za

The protocol of the Second Southern African Bird Atlas Project (SABAP2) (Underhill 2016), as used in South Africa, Lesotho and Swaziland, is most appropriate in regions with a good network of observers. The original SABAP2 protocol aims for multiple checklists for every grid cell in the area being atlased, with four checklists as the minimum target, and each checklist representing at least two hours of dedicated fieldwork (Underhill 2016). This intensity of fieldwork is clearly not achievable over many parts of the original study area, including South Africa itself, let alone over most of the continent of Africa.

This paper recommends strategies for undertaking bird atlasing in Africa, making use of aspects of the SABAP2 protocol, in such a way that it is compatible with it. We call this protocol the BirdMAP protocol. The key element of compatibility is the five-minute grid system which generates cells known as “pentads” which are roughly square, and with sides which are consistently 9.2 km north to south and which vary from 9.2 km east to west at the equator and shrinking to 8.3 km east to west at 35°S and 35°N, latitudinal extent of Africa. Underhill (2016) discusses the background to the choice of this grid system.

The BirdMAP protocol envisages four sources of data for bird atlas projects in Africa. The feasibility of each of these will vary from country to country, and so will their relative contribution to the overall database.

1. Full protocol checklists. Wherever and whenever possible obtain full protocol checklists for pentads. A full protocol checklist is the product of at least two hours of intensive fieldwork in a pentad, generating an ordered list of species, which is as complete as feasible, given constraints of season and access (Underhill 2016). The motivation for recording the species in the order in which they are observed is that, broadly speaking, the most common species in the pentad will tend to be recorded near the beginning of most of the checklists for the pentad. A statistical method for exploiting this information is described in Underhill (2016).

2. Ad hoc checklists. Make ad hoc checklists for pentads whenever making a full-protocol list is logistically not feasible (Underhill 2016). An ad hoc checklist is usually made during a short visit to a pentad, or when atlasing is part of other fieldwork activities, and it is not possible to dedicate two hours to atlasing. This activity should focus primarily on areas where full protocol lists have not yet been made, but can be undertaken in all pentads. An ad hoc checklist might sometimes record only a single species. In particular, observers should be encouraged to make ad hoc checklists when they are travelling by road through unatlased regions; there is no doubt that multiple short lists made at stopping places, and even while on the move, do help provide data for distribution maps, especially for the more common and conspicuous species.

3. Photographic records. Through photographs, there is potential for observers with limited bird identification skills to participate in the atlas project. These people can generate invaluable records for the atlas, by taking photographs, georeferenced to pentad at least, and uploaded to the BirdPix section of the ADU Virtual Museum (http://vmus.adu.org.za). An expert panel identifies the species in the

– ISSN 2219-0341 –

photograph. These records can be immensely useful in filling in gaps in coverage. This source of data enables everyone to contribute in the bird atlas project, including those with little knowledge of birds.

4. Historical records. All sources of bird data should be considered. Potential sources of records include museum specimens, historical bird ringing data, bird lists made by tourists, students, expatriates, etc. The challenges with these records are georeferencing them, which needs to be done at least to pentad level, and sometimes the date is not clear either. Lists made for a clearly named waterhole in a protected area, or on a farm, or a particular wetland, or a similar small area are likely to be able to be allocated accurately to a particular pentad. In contrast, lists made along roads on a journey between towns, or for a large national park, will probably need to be discarded from this exercise. This activity is largely an "office" function.

Further considerations …

For at least the initial years of a project, data sources numbers 1 and 2 above should probably be made an equal priority for the citizen scientists who are regular project participants. It might make sense to encourage some individual atlasers to make primarily ad-hoc checklists, targeting as many pentads as possible, while others focus on full protocol checklists. This is probably a function of personal preference; some people enjoy travelling widely and not spending a lot of time in each locality, while others prefer the discipline of making full protocol checklists. Both full-protocol and ad hoc checklists are made by birders with considerable field experience in the region being atlased, and whose sight records are reliable. Birders making full-protocol checklists should be able to identify all the species they are likely to encounter in a pentad which they are atlasing.

Based on the South African experience, the ad hoc checklists will tend to be made along the main highways. The use of the five-minute grid system, which generates the pentads, provides systematic guidance on when to start a new ad hoc checklist. The importance of the grid system should not be underestimated. Without the discipline of a grid system, the choice of bird species to list becomes a matter of personal choice. The grid system is highly motivational. Each time a new pentad is entered, the search for the common species starts afresh.

Through time, as an atlas project matures, the ad hoc checklists for pentads tend to be replaced by full protocol checklists. This is done in such a way that species which were recorded only on the ad hoc lists, but not on a full protocol list, are retained.

With the BirdLasser app, the map reading is rendered easy, and the initial recording of a species on the checklist generates the final ordered checklist of species submitted to the project (Nel & Underhill 2016). BirdLasser enables both full protocol and ad hoc checklists to be made efficiently. In addition, the exact coordinates at which each species was recorded are retained in the database. These are potentially available for species distribution modelling (Franklin 2009).

Whether they make checklists which are full protocol or ad hoc, atlasers should aim to form continuous strings of pentads with data, creating "caterpillars" of pentads which have been visited. Caterpillars, and especially caterpillars of full protocol checklists, form "transect" surveys, and help enormously with the data interpolation that constitutes the essence of species distribution modelling.

Based also on the South African experience, the natural pattern of growth is for "carpets" of atlased pentads to develop around centres of human concentration. This is the process to encourage, and to gradually expand coverage outwards and to fill in "holes". Areas around cities are also potentially the places where development pressure is likely to be greatest, and for which it is valuable and important to collect baseline bird data.

– ISSN 2219-0341 –

The Namibian Bird Atlas Project is providing an interesting model of progress. Like many other countries in Africa, Namibia is a country with a low density of birders who are potential participants. By mid-September 2016, 1,195 pentads (11.3%) of the 10,617 pentads in the country had received at least one full-protocol list. However, a further 1,779 pentads had ad hoc checklists, so that in total 2,974 pentads of the country had either a full-protocol checklists or an ad hoc checklist, so that, overall, there was at least some data for 28.0% of Namibia (Figure 1). This is enabling interim maps of the more common species to be generated on a pentad scale (Underhill & Brooks 2016) (Figure 2).

Where resources to mount atlasing expeditions are available, a balance is needed between maximizing the number of records collected and their value, and maximizing the "footprint" of the expedition. The contrast is between getting full-protocol checklists for a set of contiguous pentads, and getting scattered checklists for a larger area. This balance needs to be considered carefully in relation to local constraints. From an interpolation perspective, one pentad per quarter-degree grid cell is a useful guideline. Quarter degree grid cells are generated by a 15 minute grid; there are nine pentads per quarter-degree grid cell (and 16 quarter degree grid cells per degree cell). A useful guideline might be a minimum of one full-protocol checklist per quarter-degree grid cell, and as many ad hoc checklists from as many pentads as possible.

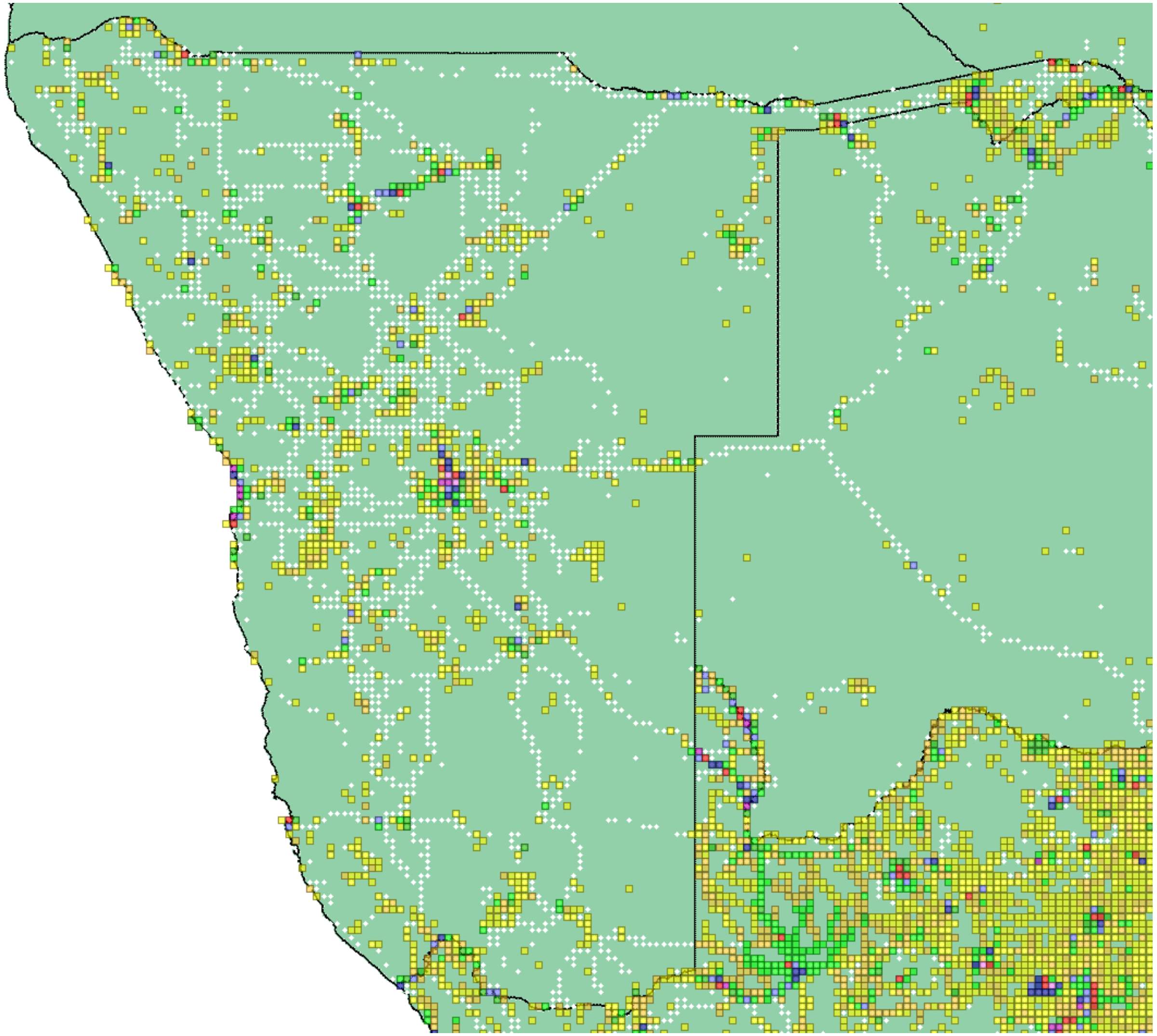

Figure 1. Atlas coverage map for Namibia, September 2016. Pentads with full protocol checklists are represented in graded colours, with yellow representing one checklist. Pentads with only ad hoc checklists are shown as white circles. See Underhill (2016) for more detail

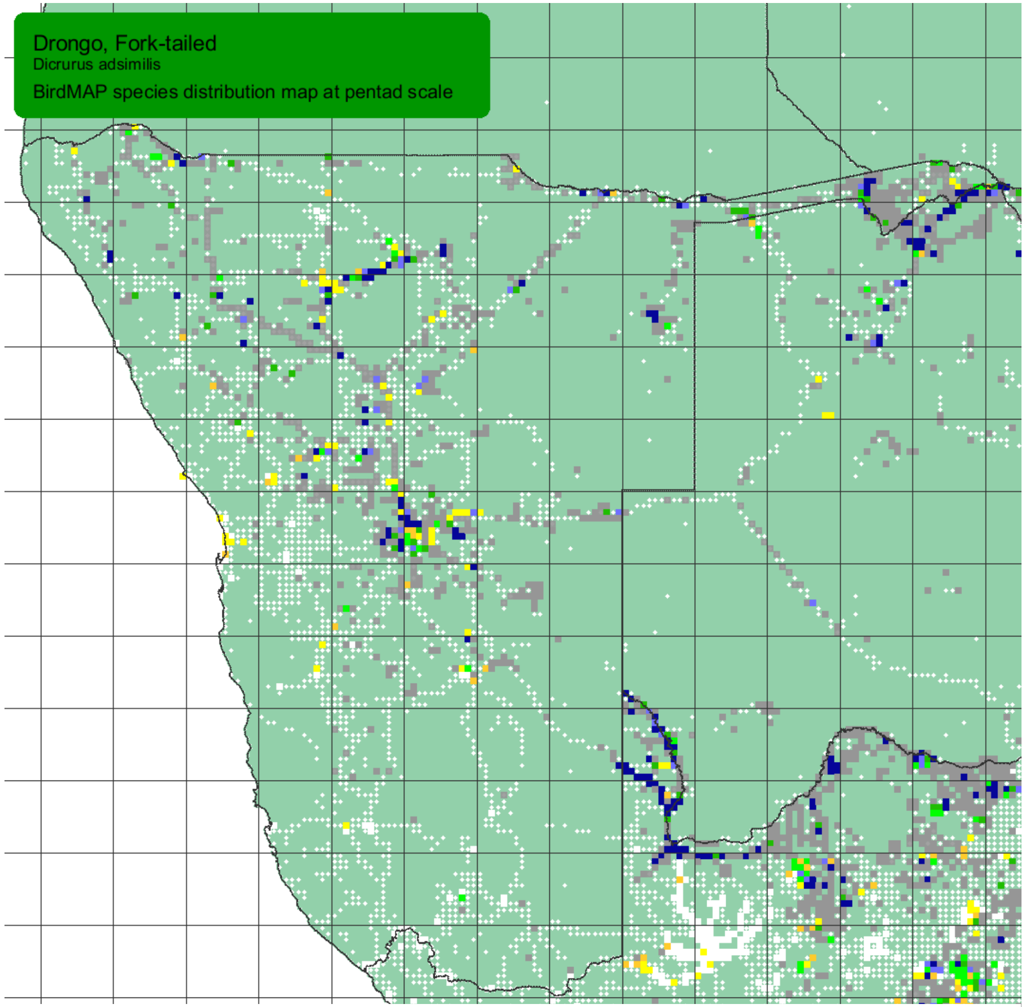

Figure 2. Distribution map of the Fork-tailed Drongo Dicrurus adsimilis *in Namibia, September 2016. For pentads with four or more full protocol checklists, reporting rates are shown in colour. Otherwise presence is represented by grey, and absence by white. See Underhill & Brooks (2016) for full interpretation description*

These will tend to be the pentads travelled through to reach the full-protocol pentads.

In order to make it easier to apply species distribution modelling, thought should be given to getting a sample of full protocol checklists from each of the biomes of the region being atlased. This is an important consideration when deciding where to encourage individual atlasers to go where to send groups of atlasers on atlasing expeditions.

Atlasers should also be encouraged to collect data not only from the pentads where long lists of bird species are anticipated, but also to visit pentads in which birding is expected to be difficult, and only a few species are expected to be recorded. The importance of getting a good representation of data from pentads which are bird poor cannot be overestimated. It is only as we have good information from the “cold spots” can we argue that the “hot spots” are conservation priorities.

Records submitted to the BirdPix section of the ADU Virtual Museum do not need to be high-quality prize-winning photographs. All that is required is that the species be identifiable. This means that cell phone cameras are generally capable of producing valuable records. It is good practice, when making full protocol and ad hoc checklists, to try to take a photograph of any species that is unexpected in the pentad in which it is recorded. This effectively provides “specimen evidence” of the record.

Final comments

The alternative to a grid-based protocol is the naïve protocol (Underhill 2016). This is the protocol which simply says “georeferenced the positions of as many birds as possible (and let the clever analysts work out what to do with the data)". The BirdMAP protocol, described here, has two deeply profound advantages, which trump the naïve protocol.

1. The grid system standardizes effort. The division of the landscape into pentads provides the critical guidance about how far you need to travel before the next Pied Crow *Corvus albus* becomes important. Once you cross the boundary into a new pentad (and the BirdLasser app takes care of this, wherever you are in Africa) you start a new list. The pentad grid system relentlessly provides this common discipline on all participants.

2. The grid system motivates. The grid system motivates in several ways: (a) when the observer crosses into the new pentad, the search for all species is reignited; (b) the coverage map becomes the catalyst for trip planning; (c) by counting atlased pentads, the grid system facilitates a metric through which project progress can be measured by country, by region within a country, by year, etc.

In technical terms, the coverage map represents gamification at its best. Gamification has nothing to do with turning atlasing into a "game"; it is better defined as "persuasive design" (Ainsley & Underhill 2016). It engages people and helps motivate them to achieve the goals of the bird atlas project. Gamification taps into the basic natural desires of people: socializing, learning, competition, achievement, status and altruism. For the bird atlas project, it leverages participation through the recognition of individual achievements in attaining common goals. Gamification succeeds because it makes chores feel like games (Ainsley & Underhill 2016).

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