BirdPix – report on the photographic atlas of the birds of Nigeria, 2012–2019

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Bird atlas, BirdPix, citizen science, Nigeria

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Abstract

This paper describes progress with the atlas of birds of Nigeria, from 7 March 2012 to 15 December 2019. The database of the project contained 658 records of 246 species submitted to the BirdPix section of the Virtual Museum. The BirdPix section of the Virtual Museum was launched in 2012 and is a supplementary data capture project for the African Bird Atlas. Over this period, for Nigeria, twelve citizen scientists contributed records to BirdPix. The most frequently recorded species were Laughing Dove Streptopelia senegalensis (769 records across its range, with 12 in Nigeria, from 12 grid cells), and Northern Red Bishop Euplectes franciscanus (30 records across the range, and recorded in 11 grid cells in Nigeria). At least two photographs of species range extensions had been submitted. This paper highlights the role of citizen science in biodiversity conservation and provides up-to-date information on the species distribution maps and lists of bird species recorded in the grid cells. Without a doubt, the BirdPix database will only be comprehensive if it contains the entire knowledge base of the species occurring within each grid cell. Data generated in the BirdPix project can be used for monitoring and modelling changes in species distributions over time. Increased awareness of the concept of citizen science and increased volunteer recruitment should be top priorities.

Keywords: Biodiversity mapping, Conservation, Public awareness, Species distribution

What is BirdPix, and why does it matter?

BirdPix is a photographic atlas of birds of Africa. It was launched in 2012. In Nigeria, the first record was uploaded into the BirdPix database on 7 March 2012, though historical records date back to 27 February 2007 (Figure 1). The goals of the project are (1) to assist with the mapping of the current distributions of birds occurring in Africa, and (2) to serve as a repository of photographic distribution records for this group (Loftie-Eaton et al. 2018). This ambitious project helps to provide up-to-date distribution maps for birds, important organisms within biodiversity research that serve as good indicators of environmental modification, and facilitates the prioritization of areas for biodiversity conservation (Donald et al. 2019).
BirdPix is an excellent place to deposit photos of species that are outside of their normal ranges. For atlasers, it can be used to keep photos of species for which “Out of Range Forms” (ORFs) are generated. For bird ringers, BirdPix can be used to store interesting photos of birds in the hand; for example, pictures showing unusual patterns of wing moult, plumage variation with age and sex, etc. BirdPix is especially valuable as a source of incidental records for the formal Nigeria Bird Atlas Project (Tende et al. 2016) in that it enables people who are not confident of their bird identification skills to contribute to mapping distributions. Although the person uploading the photograph to BirdPix is encouraged to provide identification, the expert panel for the project tries to identify all records to species level.

Not only does BirdPix provide information about the current distribution of birds, but the backgrounds to the photos also help reveal information about the diversity of habitat types they depend on. Data from BirdPix has the potential to influence policy and decision making on issues related to biodiversity conservation, particularly for birds. In this paper, I summarize the records of the BirdPix database for Nigeria submitted over the period 7 March 2012 to 15 December 2019.

BirdPix database

This paper provides information related to BirdPix records of the birds of Nigeria as well as a distribution map. It makes use of the open-access citizen science database developed and managed by the Animal Demography Unit (ADU), the University of Cape Town, South Africa (Fitzpatrick Institute of African Ornithology, available online as BirdPix at http://vmus.adu.org.za/?vm=BirdPix). This paper is based on species recorded in the quarter degree grid cells (QDGCs) in Nigeria

What is citizen science?

Citizen science is a concept which engages the public in a scientific project (Kobori et al., 2016), or otherwise involves public participation in some or all aspects of biodiversity and environmental assessments (Chandler et al. 2017). On one hand, citizen scientists are people who have chosen to use their free time and resources to engage in scientific processes (Louv & Fitzpatrick 2012). Through this concept, scientists and the public share ecological knowledge, taxonomic skills and awareness of biodiversity loss through collaborative research projects at national, regional or geographic scales. These include, for example, bird atlases, i.e. monitoring trends of bird populations, migration, etc.; aquatic insect counts; sea turtle surveys; and reef fish surveys (Louv & Fitzpatrick 2012). This approach to biodiversity mapping (biomapping) has a long history dating back to the beginning of science and natural history observation, including the work of John Ray, the great 17th-century naturalist who involved many volunteers in specimen collection (Kobori et al. 2016).

Nevertheless, the concept of citizen science has only gained tremendous attention in recent decades; in particular, due to increasing threats to biological diversity and the need to map the distributional patterns of species and ensure their conservation. Citizen scientists can generate huge datasets which have yielded important discoveries and results such as tracking biological changes and the impacts of environmental, anthropogenic and climatic phenomena on biodiversity (Donnelly et al. 2014). Worldwide, a number of organizations are involved in citizen science movements, such as the National Wildlife Federation of the United States, the Woodland Trust in the United Kingdom, and Fitzpatrick Institute of African Ornithology, South Africa (Louv & Fitzpatrick 2012). In Nigeria, the A.P. Leventis Ornithological Research Institute (APLORI) runs and promotes citizen science, with fewer than 200 volunteers as of June 2020 http://nigeriabirdatlas.adu.org.za/coverage.php

History of citizen science and biomapping in Nigeria

The formal launch of the Nigeria Bird Atlas Project (NiBAP) in November 2015 largely marked the beginning of organized citizen science in Nigeria. NiBAP is an initiative of the APLORI, launched with technical support from the ADU, who successfully managed the Southern African Bird Atlas Project (SABAP) for over 10 years. With the primary aim of engaging citizen participation to update and map the distributions of birds in Nigeria, NiBAP started with a project team of just three individuals at its launch. However, participation has gradually grown since
then to include over 190 individuals in June 2020.

http://nigeriabirdatlas.adu.org.za/coverage.php

Public awareness and participant engagement were mainly carried out via seminars and training workshops at Universities across the country. One such event, titled “Atlasing and monitoring in Africa” was conducted in November 2017, with APLORI collaborating with the ADU to host two days of meetings between managers, stakeholders and other key citizen scientists to discuss current and ongoing atlas and monitoring schemes based on the protocol developed by the ADU. During this meeting, Dr. Megan Loftie-Eaton delivered a presentation titled “The Virtual Museum (VM)” and introduced the idea of biomapping through nature photography, also highlighting the role of citizen scientists in biomapping through the VM project. These projects include BirdPix (distribution maps

Table 1. Bird observers who submitted records from Nigeria to the BirdPix database before 15 December 2019.

| Observer                | Records |
|-------------------------|---------|
| Ringim, Abubakar S.     | 476     |
| Dickson, Rob            | 70      |
| Underhill, Les          | 53      |
| Owolabi, Bibitayo A.    | 36      |
| Cronje Pieter           | 27      |
| Okafor, Chioma          | 26      |
| Rodstrom, Gunilla       | 6       |
| Talatu, Tende           | 4       |
| Elstadt, Cobus          | 4       |
| Adekola, Oluwadunsin    | 3       |
| Braimoh, Bukola         | 3       |
| Elisha, Emmanuel Barde  | 1       |

Table 2. The 30 most recorded species in Nigeria in the BirdPix database on 15 December 2019. The first column provides the BirdPix species codes and the final column the number of records.

| Code | Family               | Species                | Common name                  | n  |
|------|----------------------|------------------------|------------------------------|----|
| 317  | Columbidae           | Streptopelia senegalensis | Laughing (Palm) Dove         | 12 |
| 3748 | Ploceidae            | Euplectes franciscanus | Northern Red Bishop          | 11 |
| 846  | Viduidae             | Vidua macroura         | Pin-tailed Whydah            | 9  |
| 851  | Viduidae             | Vidua chalybeata       | Village Indigobird           | 9  |
| 3506 | Alaudidae            | Galerida cristata      | Crested Lark                 | 9  |
| 129  | Accipitridae         | Milvus aegyptius       | Yellow-billed Kite           | 8  |
| 2032 | Glaeolidae           | Pluvianus aegyptius    | Egyptian Plover (Crocodile-bird) | 8  |
| 3974 | Estrildidae          | Uraeginthus bengalensis | Red-cheeked Cordon Bleu      | 7  |
| 161  | Accipitridae         | Accipiter badius       | Shikra (Little Banded Goshawk) | 7  |
| 410  | Meropidae            | Merops pusillus        | Little Bee-eater             | 7  |
| 264  | Scolopacidae         | Tringa glareola        | Wood Sandpiper               | 7  |
| 1702 | Pyconotidae          | Crinifer piscator      | Western Grey Plantain-eater  | 7  |
| 3972 | Ploceidae            | Sporopipes frontalisl | Speckle-fronted Weaver       | 7  |
| 1530 | Coraciidae           | Coracias abyssinica (C. abyssinicus) | Abyssinian Roller | 7  |
| 1031 | Charadriidae         | Vanellus spinosus      | Spur-winged Plover (Lapwing) | 7  |
| 872  | Fringillidae         | Emberiza tahapisi      | Cinnamon-breasted (Rock) Bunting | 6  |
| 3996 | Viduidae             | Vidua orientalis       | Northern (Sahel) Paradise-Whydah | 6  |
| 163  | Accipitridae         | Passer griseus         | Northern Grey-headed Sparrow | 6  |
| 355  | Centropodidae        | Melierax metabates    | Dark Chanting-Goshawk        | 6  |
| 1141 | Pyconotidae          | Pycnonotus barbatus    | Common Bulbul                | 6  |
| 2274 | Laniidae             | Corvina corvina       | Yellow-billed Shrike         | 6  |
| 1149 | Placeidae            | Ploceus cucullatus     | Village (Spotted-backed) Weaver | 6  |
| 351  | Columbidae           | Centropolis senegalensis | Senegal Coucal               | 6  |
| 311  | Columbidae           | Columba guinea         | Speckled (Rock) Pigeon       | 6  |
| 517  | Dicruridae           | Dicrurus adsimilis     | Fork-tailed Drongo           | 6  |
| 394  | Cerylicidae          | Ceryle rudis           | Pied Kingfisher              | 5  |
| 4104 | Fringillidae         | Serinus leucopygius    | White-rumped Seedeater       | 5  |
| 424  | Bucerotidae          | Tockus nasutus         | African Grey Hornbill        | 5  |
| 1880 | Columbidae           | Streptopelia vinacea   | Vinaceous Dove               | 5  |
| 1660 | Psittacidae          | Psittacus senegalus    | Senegal Parrot               | 5  |
for birds), FrogMAP (distribution maps for amphibians), LepiMAP (distribution maps for butterflies and moths), and ScorpionMAP (distribution maps for scorpions).

Through advocacy and creating continued awareness, participation in citizen science projects continues to grow in Nigeria. However, there appears to have been relatively greater engagement in NiBAP than in biomapping projects in Nigeria. By 15 December 2019 there were 12 contributors to the BirdPix project in Nigeria (Table 1). Concerted efforts to promote increased public engagement in biomapping via the VM project are therefore badly needed. The VM has enormous potential, considering the relatively low level of expertise required to participate and the diversity of taxa represented, including reptiles, mushrooms, spiders, scorpions, dragonflies, etc.

Is there a gap?

Mapping the distributions of over 900 bird species in Nigeria (Dowsett 2018) within each QDGC is indeed a huge challenge. As Nigeria’s biodiversity is predicted to plummet, largely due to increasing human population, urbanization, habitat loss, and pollution, mapping the distribution of birds is particularly urgent. A strong understanding of bird distributions will ensure the successful conservation of birds and other taxa, since birds are good umbrella species (Roberge et al. 2008).

How many records were submitted to BirdPix?

A total of 658 photographic records were submitted from Nigeria to the BirdPix database up to 15 December 2019. These included 246 spe-

Figure 2. BirdPix distribution map for *Streptopelia senegalensis* in Nigeria.

Figure 3. On 15 December 2019, there were 769 records of *Streptopelia senegalensis* in the BirdPix database across Africa. This Nigerian record is curated at [http://vmus.adu.org.za/?vm=BirdPix-107132](http://vmus.adu.org.za/?vm=BirdPix-107132).
Sixty species and were made in 90 quarter degree grid cells (Figure1). Thirty species have at least five BirdPix records (Table 2). The two most frequently recorded species were Laughing Dove *Streptopelia senegalensis* (recorded in 12 grid cells), (Figures 2 and 3) and Northern Red Bishop *Euplectes franciscanus* (11 grid cells) (Figures 4 and 5).

### Are there remarkable submissions in the BirdPix database from Nigeria?

Since 2012, citizen scientists have made important but interesting submissions to the BirdPix project. Though every species is considered valuable, there are a few outstanding submissions which highlight the

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**Figure 4.** BirdPix distribution map for *Euplectes franciscanus* in Nigeria.

**Figure 5.** On 15 December 2019, there were 30 records of *Euplectes franciscanus* in the BirdPix database across western and eastern Africa, between Senegal and Ethiopia. This is one of the 11 Nigerian records in BirdPix, curated at [http://vmus.adu.org.za/?vm=BirdPix-84550](http://vmus.adu.org.za/?vm=BirdPix-84550).
importance of citizen science. BirdPix No. 107184 is a record of House Sparrow *Passer domesticus* from Potiskum, Yobe State, on 4 October 2018 ([http://vmus.adu.org.za/?vm=BirdPix-107184](http://vmus.adu.org.za/?vm=BirdPix-107184)) (Figure 6). The second record of this species was from Azare, Bauchi State, on 1 February 2019 (curated at [http://vmus.adu.org.za/?vm=BirdPix-71542](http://vmus.adu.org.za/?vm=BirdPix-71542)). The distribution of the species was previously confined to the far northeastern corner of the country (Borrow & Demey 2014). Wilson & McGregor (2002) reported the first sighting of the species at Baga, Lake Chad, Borno State. These records (in Potiskum and Azare, respectively) indicate a westward range extension of the species (Ringim et al. 2019).

BirdPix No. 99229 is a record of Grey-backed Fiscal *Lanius excubitoroides* from Yola, Adamawa State, on 4 December 2019 (Figure 7). This photographic record provides the first proof of the extension of the species’ known range by c. 300 km south-westwards of its previously documented distribution in Nigeria (Ringim et al. 2020).

Photographic evidence of the occurrence of threatened species is of value to conservation managers. The BirdPix database contained 11 records of seven Red List species on 15 December (2019) (Table 3).

**How do I participate in the BirdPix project?**

In order to take part in the BirdPix project, you only need to take photos of birds and upload them to the BirdPix section of the Virtual Museum website at [http://vmus.adu.org.za/](http://vmus.adu.org.za/). Do not worry if you cannot identify the photographed species, as an expert panel does this. Taking photographs of birds can be easy, as many species spend most of their time foraging or roosting. This provides the opportunity to take photographs at several angles. Moreover, many species occupy a specific niche, and will generally remain within the niche long enough to take several photographs from different angles.

Before uploading to the Virtual Museum, you need to register as a citizen scientist. The registration process is described here: [https://www.slideshare.net/Animal_Demography_Unit/how-to-register-as-a-citizen-scientist-with-the-animal-demography-unit](https://www.slideshare.net/Animal_Demography_Unit/how-to-register-as-a-citizen-scientist-with-the-animal-demography-unit). Once registered, log on to the website using your email address and password. The “Data upload” section now becomes visible. The critical information that needs to be uploaded into the database is date, location, and a series of one to a maximum of three photographs of a single species, preferably different angles of the same individual. Guidance on the upload process is provided in this slideshow: [https://www.slideshare.net/Animal_Demography_Unit/how-to-submit-records-to-the-virtual-museums](https://www.slideshare.net/Animal_Demography_Unit/how-to-submit-records-to-the-virtual-museums)

The expert panels and the most experienced citizen scientists will in most cases confirm species identifications within a week. Some records take longer, in part due to large numbers of submissions and the fact that for some photos, species-level identification is not possible (Underhill et al. 2018). Records are sometimes identified to genus or

![Figure 6. BirdPix record 107184, *Passer domesticus* from Potiskum, Yobe State, submitted by the author. It represents a westward range expansion. Further details are at [http://vmus.adu.org.za/?vm=BirdPix-107184](http://vmus.adu.org.za/?vm=BirdPix-107184)](https://www.slideshare.net/Animal_Demography_Unit/how-to-submit-records-to-the-virtual-museums)
family level, whereas some species can readily be identified from a poor, even partially blurred photograph (Underhill et al. 2018). However, a few species can only be identified in the hand, mostly Warblers and Cisticolas. As a beginner participant, the best strategy for receiving positive confirmed identification is to submit the best photograph. The most important parts of the bird to have in sharp focus are the face and wing. There is an exceptional field guide to the Birds of Western Africa written by Nik Borrow and Ron Demey. It is published by Princeton or Helm. It describes and illustrates 1300 bird species occurring in all 23 countries of Western Africa (Borrow & Demey 2014).

What instruments do I need?
To make a submission to the BirdPix project, you only need a smartphone or digital camera for taking photographs. Then follow the upload procedure described above. For location coordinates, you do not necessarily need a Global Positioning System (GPS) to take point coordinates, because the VM website is equipped with Google Earth and Map to help you locate the point where the species was photographed.

Primary challenges facing citizen science in Nigeria
Although citizen science has long been in existence, its development in Nigeria as in most African countries is still in its infant stage and is largely challenged by a lack of strong enthusiasm among citizens. This is mainly from lack of awareness on the importance of biomapping and conservation, but also poverty since not many citizens are willing to sacrifice their resources and time for data collection. Moreover, those with keen interest are constrained by limited access to resources and field instruments like binoculars, cameras, and transport, making it difficult to go out and report observations. On one hand, some withdraw from the project after realizing that it is an unpaid activity. Uncertainties including insecurity, kidnapping, insurgency, and banditry are also considerable challenges affecting citizen science participation across the country. This is on the grounds that citizen scientists do not have a sense of security going out to the bush for biomapping. In some cases, citizen scientists are misunderstood by security personnel and locals as informants to kidnappers or bandits because of their gear, for example, binoculars and digital cameras they carry.

Conclusions and recommendations
This paper highlights the content of the BirdPix database in Nigeria. It provides up-to-date information on the species distribution maps and lists of bird species recorded in the BirdPix project’s grid cells. Without a doubt, the BirdPix database will only be comprehensive if the database contains the entire knowledge base of species occurring within each QDGC. Data generated in the BirdPix project can be used for
monitoring and modelling changes in species distribution, and composition over time (Underhill et al. 2018). Increasing local awareness of the concept of citizen science and recruiting more volunteers should be top priorities.

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### Table 3. The seven globally threatened species (based on the IUCN RedList) in the BirdPix database for Nigeria as of 15 December 2019

| Code | Scientific name | Common name | Red List | n | Last recorded     |
|------|----------------|-------------|----------|---|-------------------|
| 108  | *Torgos tracheliotus* | Lappet-faced Vulture | EN | 1 | 23-01-2009       |
| 111  | *Neophron percnopterus* | Egyptian Vulture | EN | 1 | 07-03-2012       |
| 110  | *Necrosyrtes monachus* | Hooded Vulture | CR | 5 | 13-10-2019       |
| 107  | *Gyps africanus* | White-backed Vulture | CR | 1 | 27-02-2007       |
| 109  | *Trigonoceps occipitalis* | White-headed Vulture | CR | 1 | 27-02-2007       |
| 3894 | *Ploceus bannermani* | Bannerman's Weaver | VU | 1 | 14-05-2018       |
| 151  | *Terathopius ecaudatus* | Bateleur | NT | 1 | 22-06-2019       |
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