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BIRD DISTRIBUTION DYNAMICS

BIRD DISTRIBUTION DYNAMICS 2 – MACCOA DUCK *OXYURA MACCOA* IN SOUTH AFRICA, LESOTHO AND SWAZILAND

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Introduction

The global conservation status of the Maccoa Duck *Oxyura maccoa* was classified as “Near-threatened” in 2007; this is also its regional conservation status in South Africa (Taylor et al. 2015, BirdLife International 2016e). The species has been the subject of an intensive species action plan process starting in 2005 (Berruti et al. 2005) and culminating with the formal endorsement and adoption of the International Single Species Action Plan by the Fourth Session of the Meeting of the Parties to the African-Eurasian Waterbird Agreement in 2008 (Berruti et al. 2007). The aim of the action plan was to “To stabilise or increase natural populations of Maccoa Duck as indicators of sustainable wetland management for the benefit of people in Africa by 2010” (Berruti et al. 2005, 2007)

There are six species in the genus *Oxyura* popularly known as the “stiff-tails”; they are freshwater diving ducks (del Hoyo et al. 1992). Three are classified as “Least Concern”, but population sizes are thought to be decreasing in their natural ranges, two are classified as “Near-threatened” (Maccoa Duck in Africa, and Blue-billed Duck in

Australia) and one is classified as “Endangered” (White-headed Duck *O. leucocephala* occurring in southern Europe, northern Africa and southwestern Asia) (BirdLife International 2016a-f). A small number of Ruddy Ducks *O. jamaicensis*, a species native to North America where it is decreasing, escaped from the waterbird collection of the Wildfowl and Wetland Trust at Slimbridge, UK, and subsequently spread across western and southern Europe and into Asia and northern Africa; there is an established population in Morocco, with records from Algeria, Tunisia and Eritrea (del Hoyo et al. 1992, Berruti et al. 2007, BirdLife International 2016c). The greatest threat to the White-headed Duck is hybridization with the alien and invasive Ruddy Duck (BirdLife International 2016c). Ruddy Duck males are behaviourally dominant over White-headed Ducks, exacerbating the extent of hybridization (Muñoz-Fuentes et al. 2007, BirdLife International 2016d)

Berruti et al. (2007) provided a comprehensive biological assessment of the Maccoa Duck. The main countries within the range of the Maccoa Duck are Angola, Botswana, Ethiopia, Kenya, Lesotho, Namibia, South Africa, Tanzania and Zimbabwe; the total population was estimated in 2005 to be in the range 9,000–11,750 birds (Berruti et al. 2007). Maccoa Ducks are considered rare in southern Africa, and individual wetlands display fluctuating numbers (Maclean 1997). Because of its skulking habits, this duck is difficult to monitor and to get reliable estimates of population and of trends. The southern African population was estimated at 7,000–8,250 birds in 2005, is geographically disjunct from the two other populations in eastern Africa. The South African population was estimated to be 4,500–5,500 birds (Berruti et al. 2007). Thus about 50% of the world population, and approximately two-thirds of the southern African population of Maccoa Duck are in South Africa. Clearly, South Africa carries a major responsibility for the conservation of this species.

One of priority activities listed in the action plan is to “obtain improved population estimates and distribution of the Maccoa Duck” (Berruti et al. 2007). This paper aims to do the latter, by presenting the distribution map from the Second Southern African Bird Atlas Project

(SABAP2) for the Maccoa Duck. It also aims to help to understand changes in distribution, and to a lesser extent, changes in abundance, in the quarter-century between SABAP1 (mid-date 1989) and SABAP2 (mid-date for data collection so far falls in 2012).

Methods

The fieldwork protocol for the Second Southern African Bird Atlas Project (SABAP2) was described by Underhill (2016a) and the progress during the first nine years of the project (July 2007 to June 2016) was summarized in Underhill & Brooks (2016a). The spatial unit of SABAP2 is the “pentad”, grid cells with dimensions five minutes of longitude by five minutes of latitude, which translates into 9.2 km north to south and 8.3 km east to west (Underhill 2016). By December 2016, a total of 8.9 million records of bird distribution had been made, and 77% of the 17,339 pentads of South Africa, Lesotho and Swaziland had been visited at least once (SABAP2 website, <http://sabap2.adu.org.za>). Four more full-protocol SABAP2 checklists had been made for 34% of the pentads.

The SABAP2 distribution map for the Maccoa Duck was downloaded from the SABAP2 database on 10 December 2016. The guidelines to the interpretation of this map are contained in Underhill & Brooks (2016b). An important component of these distribution maps is that reporting rates are shown for pentads with four or more checklists; otherwise only presence absence is shown. Likewise, the range-change map which shows the change in distribution and abundance between SABAP1 was downloaded and interpreted (Underhill & Brooks 2016c). The range-change map uses a 15-minute grid, because this was the spatial resolution of SABAP1. For the purpose of making comparisons, the data for the nine pentads within the SABAP1 quarter-degree grid cell were pooled, as described in Underhill & Brooks (2016c).

Results

On the pentad scale, the distribution of the Maccoa Duck within South Africa shows an extremely fragmented distribution (Figure 1). This is not an artefact of data collection; in the Western Cape and Gauteng, there are large numbers of checklists for many pentads, and the patchy distribution occurs even in regions with large volumes of data.

Table 1. Range-change summary for the Maccoa Duck between SABAP1 and SABAP2. Numbers (and percentages) in each colour category of Figure 3, for which there are at least four checklists per quarter degree grid cell in both SABAP1 and SABAP2. Also shown are the same summaries when the analysis is restricted to grid cells with at least 30 checklists for both SABAP1 and SABAP2.

Status	Four checklists for SABAP1 and 2		30 checklists for SABAP1 and 2	
	Count	%	Count	%
Red (very large decrease)	243	50	141	49
Orange (large decrease)	29	6	19	7
Yellow (small decrease)	23	5	15	5
Light green (small increase)	23	5	18	6
Dark green (large increase)	43	9	29	10
Blue (very large increase)	126	26	66	23
Totals	487	100	288	100

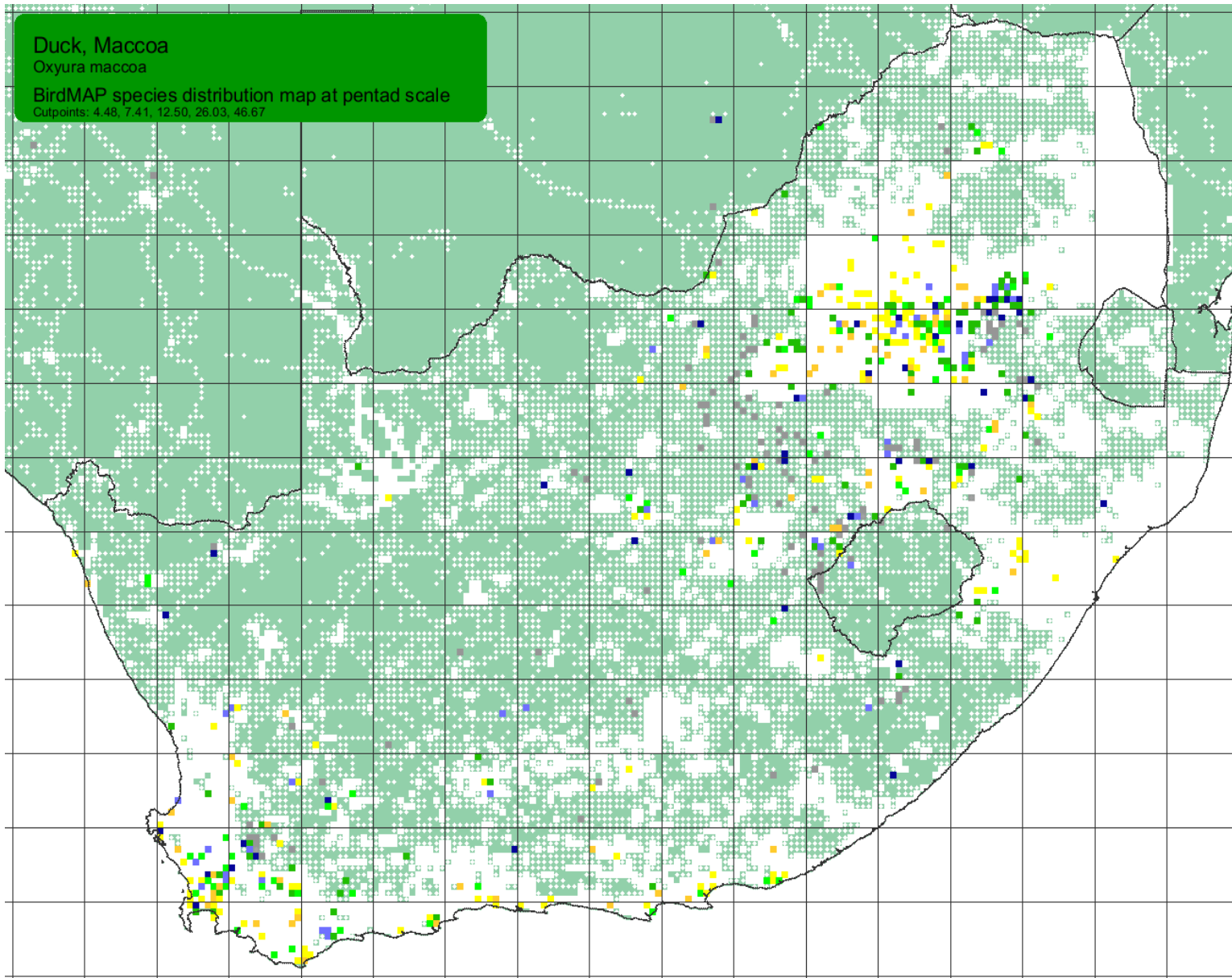


Figure 1. Pentad-scale distribution map for the Maccoa Duck, based on SABAP2 data. Downloaded 10 December 2016. Interpretation guidelines are contained in Underhill & Brooks (2016b). Pentads with four or more full protocol checklists are either shaded in white to indicate that the species has not been recorded and is probably absent or shaded in colour to indicate reporting rate: yellow 0–4.5%, orange 4.5–7.4%, light green 7.4–12.5%, dark green 12.5–26.0%, light blue 26.0–46.7%, dark blue 46.7–100%. For pentads with fewer than four checklists, presence is shown in grey, and possible absence as a small white dot. For pentads shaded turquoise, there is no SABAP2 data.

The largest concentration of pentads where this species occurs was in the high altitude grasslands of Mpumalanga, extending into Gauteng, Free State and North West. There was a scattering of records through the fynbos biome, along the coastal plain of the Western Cape and Eastern Cape. There were few records in the savanna biome in northern and northwestern South Africa. There were records in Lesotho, along the border with the Free State, and none in Swaziland. Maccoa Ducks were not recorded in pentads shaded white in Figure 1, in spite having at least four full protocol checklists and a minimum of eight hours of intensive fieldwork (Underhill 2016). This suggests that the species is absent from the Kruger National Park and most of coastal KwaZulu-Natal (Figure 1).

The pentads with the largest reporting rates, relative to reporting rates for the species, are shaded dark blue (46.7–100%) and light blue (26.0–46.7%) in Figure 1. These represent the core of the range of the Maccoa Duck. These pentads were mostly widely scattered, with clusters at the De Hoop Nature Reserve east of Cape Agulhas, in the Kouebokkeveld Mountains of north of Ceres, both in the Western Cape, and along an axis from about Secunda to Middelburg, in central Mpumalanga. Pentads shaded yellow (0–4.5%) and orange (4.5–7.4%) had low reporting rates, suggesting that the species is rarely reporting over most of the Johannesburg-Pretoria conurbation in Gauteng, or in the Greater Cape Town region.

The shading of the grid cells in the range-change map for the Maccoa Duck (Figure 2) can be summarized as follows: blue, dark green and light green represent quarter degree grid cells with very large, large and small relative increases, and red, orange and yellow represent cells with very large, large and small relative decreases. The numbers of grid cells in each category are shown in Table 1. The striking feature of the range-change map for the Maccoa Duck is the predominance of quarter-degree grid cells which are red (large decrease) (50%) or blue (large increase) (26%) (Table 1, Figure 2). Only 10% of grid cells were yellow (small decrease) or light green (small increase) (Table 1). This

might suggest that wetlands which were suitable for Maccoa Ducks during SABAP1 have become unsuitable for the species during SABAP2, and *vice versa*.

This range-change analysis uses grid cells with as few as four checklists in either SABAP1 or SABAP2, and results are subject to sampling error (Underhill & Brooks 2016c). When the analysis is restricted to grid cells with at least 30 checklists in both SABAP1 and SABAP2, sampling error is considerably smaller, but there are only 288 grid cells which meet this criterion, rather than 487 (Table 1). In this restricted analysis, the results are similar to the four-checklist results: 49% of grid cells show very large decreases, and 23% show large or very large decreases.

Discussion

The information presented in this paper makes two key points. (1) The distribution of the Maccoa Duck is extremely fragmented (Figure 1). (2) The number of quarter degree grid cells showing decreases over the quarter century between SABAP1 and SABAP2 outweighed the number showing increases (Figure 2, and also Table 1). This suggests that the species had in fact decreased over this period. The extent of the decrease is not clear, but it is likely to be substantial.

In southern Africa, the range and population size of the Maccoa Duck increased during most of the 20th century, because impoundments and other artificial wetlands, both large and small, were being colonized (Berruti et al. 2007, Simmons et al. 2015, Taylor et al. 2015). Berruti et al. (2005, 2007) considered that these increases in range and abundance had ceased, and that populations in the region were either stable or had started to decrease. In the light of the results in this paper, stability seems unlikely, and it is only the magnitude of the decrease that is open to debate.

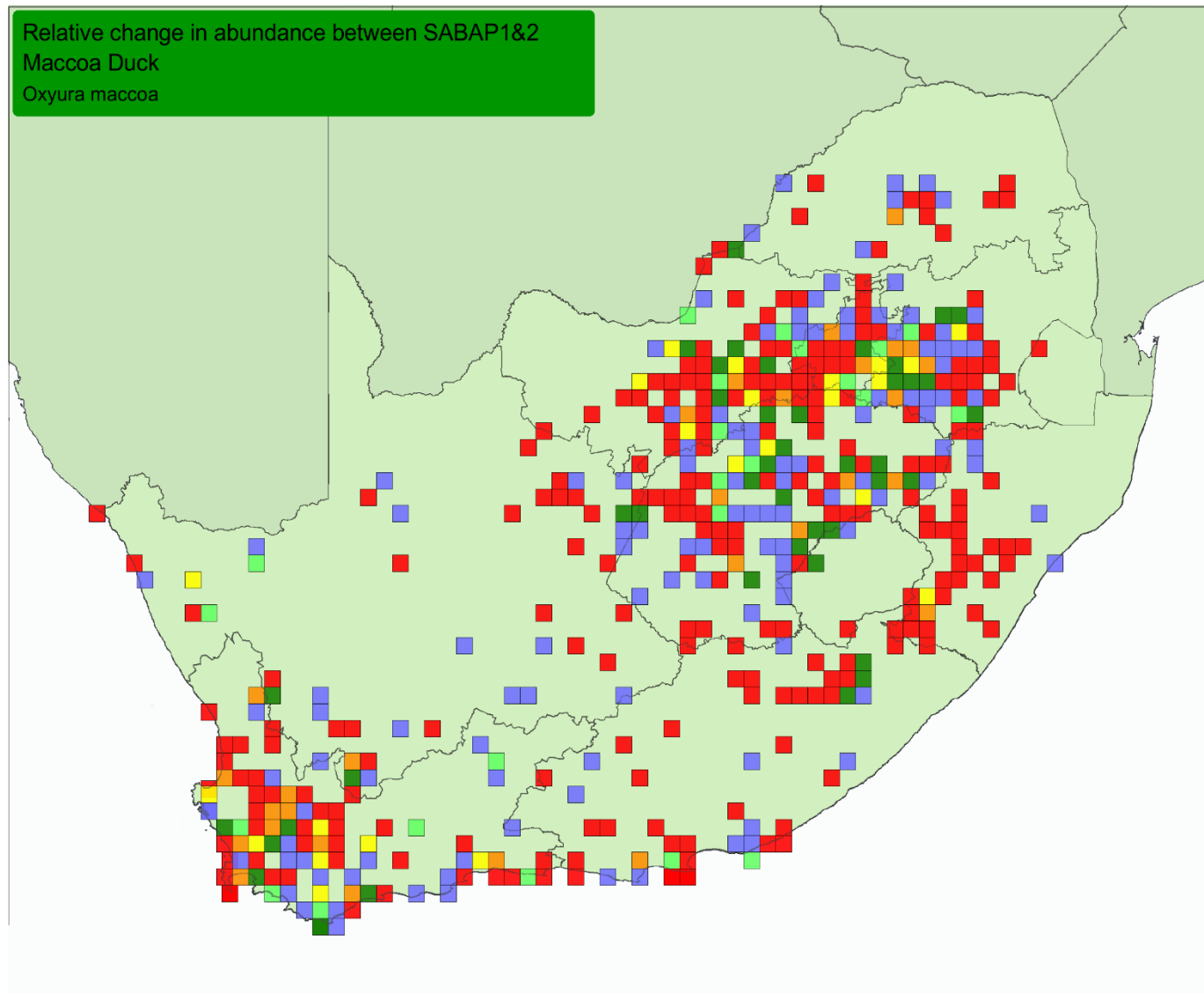


Figure 2. Range-change map for the Maccoa Duck between SABAP1 and SABAP2. See Underhill & Brooks (2016b) for interpretation guidelines. In brief, blue, dark green and light green represent quarter degree grid cells with very large, large and small increases, and red, orange and yellow represent cells with very large, large and small decreases. A count of the number of grid cells in each category is provided in Table 1. Only the 487 grid cells with at least four checklists in both SABAP1 and SABAP2 are shown. All these grid cells had Maccoa Duck recorded in them either in SABAP1 or in SABAP2 or in both.

There are almost certainly Ruddy Ducks in private waterbird collections in southern Africa. This alien invasive species has a propensity to escape from such collections (del Hoyo et al. 1992) and there has already been at least one such incident in South Africa. A Ruddy Duck was recorded by Etienne Marais on 13 January 2012 from pentad 2550_2815, the pentad that contains the Rietvlei Dam Municipal Nature Reserve, southeast of Pretoria. This pentad has 1,243 full protocol SABAP2 checklists (<http://sabap2.adu.org.za>).

It is not known whether male Ruddy Ducks will demonstrate the behavioural dominance over Maccoa Ducks, in the same way as they do over another species in the genus *Oxyura*, the White-headed Duck, which has resulted in rapid hybridization (Berruti et al. 2005, 2007, Muñoz-Fuentes et al. 2007, BirdLife International 2016d). Therefore, an important role for the bird atlas community is to continuously be on the lookout for Ruddy Ducks. Because illustrations of the Ruddy Duck are not included in the standard southern African fieldguides, photographs of the male and female are illustrated here, showing comparisons with the Maccoa Duck (Figure 3).

At first reckoning, it would appear that the only method to monitor waterbird populations is to undertake surveys at wetlands, counting the number of individuals of each species, as done for example by the Coordinated Waterbirds Count (CWAC) project of the Animal Demography Unit in South Africa (Taylor et al. 1999). However, bird atlas projects, such as SABAP2, play a key complementary role. The surveys provide detailed information about each waterbird species at the set of wetlands where waterbird counts take place. The distribution information from the bird atlas reveals the regions where the species is absent; it also reveals localities at which the species is regularly recorded, but which are not included in the wetland survey network.

Maclean (1997) summarized the habitat requirements of the Maccoa Duck: “It requires deep, highly nutritious inland waters, with emergent vegetation. Sewage ponds and saline pans are also favoured.” It

breeds in wetlands that have a combination of open freshwater, and emergent vegetation, usually reedbeds, especially *Typha* (Berruti et al. 2007). Such wetlands have a tendency to become fully covered with reedbeds, rendering them unsuitable for this duck. It is possible that, since the 1990s, the rate at which new suitable wetlands were established was exceeded by the rate at which they became choked with reedbeds.

Acknowledgements

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Figure 3. Male Ruddy Duck (top left) and male Maccoa Duck (bottom left) and female Ruddy Duck (top right) and female Maccoa Duck (bottom right). Ruddy Duck photos by Dick Daniels from Wikimedia Commons and Maccoa Duck photos by John Fincham, uploaded to BirdPix section of ADU Virtual Museum (records <http://vmus.adu.org.za/?vm=BirdPix-15019> and <http://vmus.adu.org.za/?vm=BirdPix-15020>)