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# HeronryMAP:Africa - Mapping the distribution and status of breeding sites of Ardeids and other colonial waterbirds in Africa #

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# Abstract

Heronries in Africa are poorly studied and many data gaps are evident in terms of occurrence, species composition and productivity of these colonial breeding sites. This paper introduces HeronryMAP:Africa, a citizen-science project started in 2014 that aims to systematically collect long-term data on location, size and composition, site fidelity, longevity and conflict scenarios of heronries in Africa. Preliminary results are presented for current and historical sites sourced over a three year period (2014-2016). Three hundred and thirty-six colony sites were identified and mapped in 14 (25.9%) African countries; 72.6% of sites have no formal protection, 18.8% were subject to at least one human conflict scenario with 'cutting of trees' and 'removal of trees' being the most common human disturbances. A first, but presumably grossly underestimated total of 35,000 breeding pairs of colonial waterbirds in Africa is provided from available data. No species-specific nest data are given due to the tendency to report total nest numbers in mixed colonies rather than species-specific numbers. The study revealed a general paucity of data for heronries in Africa (there was no response from 74.1% of African countries), but also the challenges faced in collecting adequate scientific data for these sites. It did, however, show how citizen-science can make significant contributions to research projects that are poorly funded or have limited resources. Human-wildlife conflicts were highlighted as an area that is poorly understood for heronries but has important conservation outcomes. Future objectives include identification of species composition, assessment of priority sites, identification of conservation action for colonies under threat and production of an Atlas of African Heronries

*Key words:* Africa; colonial waterbirds; heronries; HeronryMAP:Africa; human-wildlife conflict; monitoring.

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## Introduction

Waterbirds that breed communally in freshwater or coastal systems are spread across eight bird families: Phalacrocoracidae, Anhingidae, Pelecanidae, Ardeidae, Ciconiidae, Threskiornithidae, Phoenicopteridae and Laridae (Perennou et al. 1996, Clements et al. 2017). Most of these waterbirds breed in large colonies, either loosely or in close association; however, some species are solitary nesters, e.g. Goliath Heron (Ardea goliath) and White-backed Night Heron (Gorsachius leuconotus) (Hancock and Kushlan 1984, del Hoyo et al. 1992). Colonies may be largely discrete (e.g., pelicans, gulls, terns and cormorants) or mixed (e.g., ibises, herons, egrets and spoonbills) (Hancock and Kushlan 1984, Perennou et al. 1996). However, some species such as the White-breasted Cormorant (Phalacrocorax lucida) and Reed Cormorant (Microcarbo africanus) are also known to frequently nest in extensively mixed flocks with Ardeids and Threskiornithids (DMH pers. obs.). The term 'heronry' usually refers to breeding sites where Ardeid species nest in mixed colonies (British Trust for Ornithology 2018); however, for the purpose of this paper, I will use this term to refer to breeding colonies for the colonial species concerned.

Due to their conspicuous behavior, abundance and often socio-economic and ecological impacts, the general distribution and basic biology of most of these taxa have been well studied globally (Hancock and Kushlan 1984, Brooke and Birkhead 1991, Kushlan and Hafner 2000, Kushlan and Hancock 2005). Continentally, studies are generally well distributed: in Europe (Hafner and Fasola 1997, Marchant *et al.* 2004, British Trust for Ornithology 2018), Asia (Hong Kong Bird Watching Society 2016, Mashiko and Toquenaga 2018, Matsunaga 2018) North America (Gawlik *et al.* 1998, Spies and Weingartner 2007, Maccarone *et al.* 2010, Rush *et al.* 2015, Cox *et al.* 2017), South America (Kushlan *et al.* 

2002, Stier 2018, Yanosky 2018) and Australia (Maddock and Baxter 1991, Richardson et al. 2001, McKilligan 2005). However, gaps do exist and in Africa, information on the status and distribution of heronries is severely lacking; it is limited mainly to Southern and Eastern Africa (Tarboton 1977, Underhill et al. 2009, Turner 2011, Kopij 2014). Some data have been collected through atlas projects (Tanzania Bird Atlas; N. Baker in litt.), waterbird surveys (Botswana; Tyler 2001, Madagascar; Wetlands International 2012, Dodman 2014, Rabarisoa et al. (in review)) and some dedicated efforts of individual researchers (Turner 2002, J. Agutu unpubl. data, C. Barlow in litt.). However, most of these studies were short-term or of an irregular nature. Currently, only a single long-term monitoring program (1993 to present) for heronries in Africa is known to the author (Rabarisoa et al. (in review)). As a result, there is a gap in the knowledge of the importance of these African sites in terms of location, species composition, abundance, breeding productivity and site management (Perennou et al. 1996, Kushlan et al. 2002).

HeronryMAP:Africa was born out of a heron banding project that started in 2002 in Cape Town, South Africa (Harebottle and Gibbs 2004, 2006) and the general paucity and limited nature of information on heronries in South Africa (Tarboton 1977, Perennou *et al.* 1996, Veen *et al.* 2011). The project was officially launched on 1 August 2014 through social media with the creation of a web page via Facebook - 'HeronryMAP: Africa'.

The objective of this paper is to introduce HeronryMAP:Africa as a continent-wide, citizen-science based monitoring project for African heronries; preliminary results on the status and distribution of current and historical heronries in Africa are presented for 31 species (Appendix 1) and gaps in research and conservation interventions are identified and discussed.

#### Methods

The study area for this paper was the entire continent of Africa, the island of Madagascar and smaller offshore islands including Cape Verde, Madeira Islands, Zanzibar, Comoros, Sao Tome and Principe. Data were collected from various sources including surveys from ornithologists, heron researchers and bird club members; additional information was sourced from nest record cards (Animal Demography Unit, University of Cape Town; unpubl. data), academic or popular literature and from personal observations. The HeronryMAP:Africa web page was used extensively to request data and collate records and information about heronries throughout Africa, especially South Africa; all researchers and observers were encouraged to post records and upload images of active heronries. Standardized datasheets, available on the site, were provided for participants to use in uploading their data in a standardized format (Appendix 2). Any incidental information relating to breeding sites that was posted directly on the page was transferred to a database.

Data were grouped into current sites, 2012-2016, which had census data and historical sites, pre-2012 which included sites with census data and those which were reported as active but lacking census data. The reason for selecting 2012 as a cut-off to separate 'current' from 'historical' heronries is based on heronry dynamics; natural heronry sites generally persist for a few (2-3) years (due to natural variable landscape fluctuations or changes) before being abandoned (Perennou 1996, Underhill et al. 2009), therefore five years (prior to the final year of data gathering for this study, 2016) would be a reasonable amount of time to isolate recent, active colonies from older colonies that may have abandoned preferred sites and moved to other optimal sites.

Additional site protection status information and/

or human-related conflict issues were sourced by the author where these were not or could not be provided by the respondent or observer.

## Results

#### Spatial distribution and numbers

A total of 336 heronry sites was mapped from 14 countries across Africa (Table 1, Fig. 1); no distinction was made between colonies being mixed or discrete. Most records (n=238, 70.8%) were from southern Africa. Almost a quarter of the sites (n=73, 21.7%) were located in East Africa (including Madagascar), while 24 sites (7.1%) occurred in West Africa, including the Cape Verde Islands. Only one site (0.3%) was reported for Northern Africa (Mauritania, Table 1). No data were received from central Africa. Nearly half (45.8%) of localities (154/336) were recorded from South Africa; the next largest representations were from Kenya (32 sites), Uganda (29), Botswana (26), Lesotho (22), Zimbabwe (21) and The Gambia (21) (Table 1, Appendix 3).

Based on available data from submitted and sourced records for active heronries, a preliminary estimate of 35,000 breeding pairs was calculated from the 319 sites (out of 336 total sites) for which there were numerical data (Table 1); the estimate assumes that all historical sites (i.e. prior to 2012; n=162) have remained active with similar colony sizes that were initially reported. Seventeen sites were shown to be active prior to 2012 but lacked actual nest data. Most survey responders did not indicate any species specific numbers within a heronry; unfortunately, no verified species-specific breeding numbers are yet available in this study.

### **Protection status**

Of the breeding colonies, 72.6% (244/336) were located in unprotected areas; 16.4% (55/336) of the sites were located in formal conservation ar-

Table 1. Summary of the status of heronry sites in Africa based on submitted and additionally sourced data to Heronry
MAP:Africa. The estimated number of breeding pairs is based on available nest count data for active sites only and
should be regarded as preliminary estimates. Regions are based on those defined by the African Union (http://www.
west-africa-brief.org/content/en/six-regions-african-union): N = Northern, S = Southern, E = Eastern and W = Western.
Data sourced over a three-year period, 2014-2016.

Country	Region	Total no. of sites <sup>1</sup>	Site activity <sup>2</sup>		Site protection			Conflicts with humans		Estimated no. of
			2012-2016	pre-2012 1	Protected 3	Unprotected	Unknown	At least one conflict	Unknown	breeding pairs
South Africa	S	154 (4)	137	17 (4)	28	126		10	144	8,000+
Lesotho	S	22		22		22			22	180-200
Eswatini	S	1		1	1				1	5-10 <sup>4</sup>
Namibia	S	14		14	3		11		14	300-400
Botswana	S	26	2	24	5	17	4		26	14,000+
Zimbabwe	S	21		21	1		20		21	1,000+
Uganda	Е	29	26	3	3	26		26	3	400
Madagascar	Е	7	7		4	3		4	3	600
Kenya	Е	32 (13)	2	30 (13)	2	30		2	30	1,000+
Tanzania	Е	5 5		5	3	1	1		5	450+
Mali	W	1		1			1		1	1,000+
The Gambia	W	21		21	4	17		21		1,000+
Cape Verde	W	2		2	1	1			2	20-25
Mauritania	Ν	1		1		1			1	6,000
Total		336 (17)	174	162 (17)	55	244	37	63	273	35,000+6

<sup>1</sup> Numbers in parentheses represent the number of sites reported active but with no data available and whose status is currently unknown. <sup>2</sup> Numbers represent the number of sites reported active during each period. <sup>3</sup> Protected status includes sites that were located in national parks, nature reserves or have some other formal protection status (e.g. natural heritage sites, protected environments, biosphere reserves). <sup>4</sup> Only White-backed Night-Herons were recorded. <sup>5</sup> This total is based on Turner (2011), who only provided site and status information. At time of the analysis for this paper, data from the Tanzania Bird Atlas had not been received. <sup>6</sup> This figure sums the upper limit of ranges and other non-ranged datum in order to provide an estimate of the possible maxima from the data supplied for this study from active sites only. Note: this estimate should be seen as preliminary and as a baseline minimum for the project going forward.

eas (e.g. national parks or nature reserves) or included in Important Bird Areas and/or Ramsar Sites (Table 1, Fig. 1). The protection status for 37 colonies (11.1%) was 'Unknown'.

### Human-conflict coverage

Of the 336 sites, 81.3% (n=273) did not report any known human-wildlife conflicts; the remaining 63 sites (18.7%) had at least one known conflict (Table 1). From these 63 sites, the most frequently recorded conflicts included 'cutting of trees' and 'removal of trees'. The distribution of human-conflict issues across all sites is given in Fig. 2; the current data indicate that Kenya and South Africa recorded most of the conflict scenarios identified.

### Discussion

The results presented here are based on data sourced over a three year period and represent at least an initial attempt to document and quantify the numbers and distribution of heronries in Africa. However, it can be assumed that this is a gross under-estimation and under-representation of the real situation given the number of African countries (40 out of 54) for which no data were



Figure 1. Spatial distribution and protective status of 336 heronry sites throughout Africa based on Heronry MAP:Africa data. Protected sites are those located in formally protected areas; partially protected sites are those which are or form part of Important Bird Areas or Ramsar Sites; Unprotected sites are those sites which are known to occur outside of formally protected areas; Unknown refers to sites for which no information was available to determine protective status. Dashed lines indicate boundaries separating the five regions in Africa (see Table 1). The numerical values refer to the number of sites in each region.



Figure 2. Spatial distribution and type of human-wildlife impacts of 336 heronry sites throughout Africa based on HeronryMAP:Africa data. Hunting refers to killing of adult birds at nest sites; Mixed impacts refers to any combinations of known impacts and Unknown refers to colonies where there are no data available on conflict scenarios. Dashed lines indicate boundaries separating the five regions in Africa (see Table 1). The numerical values refer to the number of sites in each region. submitted in HeronryMAP:Africa but which probably have breeding colonies (see Clancey 1997 for Mozambique; Borrow and Demey 2010 for Ghana; and Redman et al. 2011 for Ethiopia, Eritrea, Djibouti and Somalia). This study also highlighted the challenges in collecting largescale data on nesting colonial waterbirds across the African continent. Data are often insufficient or difficult to source, particularly when sites are known from personal experience (but not documented) or personal communication but where exact details cannot be ascertained in a timely manner. These gaps, as well as the identification of the species composition and updated status of historical sites with no data available, need to be filled in order to present a clearer and more holistic picture of the status, content and distribution of heronries across Africa. Dodman (2014) does include some information on breeding colonies for some species listed in this study but often locality details are lacking or information is vague. These data will need to be sourced so that these sites can be included in HeronryMAP:Africa and any future reviews of the dataset. Ongoing assessments and conservation measures remain limited without this information. The Heron Specialist Group of the International Union for the Conservation of Nature (IUCN) Species Survival Commission recognizes these gaps and has initiated an effort to establish a list of heron researchers in Africa in order to start building a database of heron researchers and to stimulate further development of research and projects on herons (C. King in litt.).

Although the distribution of documented heronries covers only a small number of African countries (n=14, 25.9%), the majority of records stem from southern Africa, and South Africa in particular. This has largely been due to the strong citizen-science networks in the region and the response of these volunteers to requests for information on heronries in the region. Most of these volunteers used social media to supply relevant information. Eastern Africa is the region which has the second largest number of documented heronries. There have been ongoing efforts there to document and update the status of herons in the region. Turner (2011) provided detailed accounts of the status of 19 Ardeidae in eastern Africa. The Tanzanian Bird Atlas (http://tanzaniabirdatlas.net/start.htm), which has now been underway since 1985, is providing valuable highquality data for ardeid distributions and seasonality and has recently incorporated mapping active heronries into its volunteer operations (N. Baker in litt.). There are an estimated 50+ sites that have already been documented as part of the Tanzanian Bird Atlas with increasing numbers projected in the next five years (N. Baker in litt.). Western Africa has some data on heronries available through their coordinated waterbird monitoring programs (e.g. waterbird counts in Senegal and Mauritania, Veen et al. 2007) and through ex-patriots stationed in certain countries such as The Gambia (C. Barlow in litt.). Data are severely lacking from the rest of Africa, notably northern and central Africa, where up to nine and 26 species of ardeids, respectively, are known to breed (Hancock and Kushlan 1984, Brown et al. 2002).

This analysis has highlighted that only a small percentage (16.4%) of colonies are located in protected areas where sites can be protected from general human disturbance. Sites located on private land or public open spaces (e.g. parks and gardens) are subject to unpredictable threats such as human disturbance, including destruction of nests, egg predation and cutting or removal of trees. Considering most sites lack formal protection, conservation efforts for colonial waterbirds may need to be focused on private landowners in order to secure breeding sites across Africa and which may include landowner stewardship (https://www.capenature.co.za/care-for-nature/ stewardship/) and custodianship programs (Little and Theron 2014).

The results of this study explicitly show that human-wildlife conflict scenarios are generally poorly understood or recognized for colonial waterbirds in the African landscape. Expansion of species and breeding sites into urban, suburban and rural areas often bring them into close contact with people and their associated activities (Telfair et al. 2000). These species/colony-human associations regularly lead to confrontation resulting mainly from the birds' nesting and breeding activities and guano deposits posing nuisance factors and potential health risks. Many colonies are at risk; some are labelled nuisance sites due to excessive noise of breeding birds and potent guano smell (Grant and Watson 1995, Whittington-Jones 2014), while others are located close to airports or airfields creating potential collisions with aircraft as birds traverse the airfield to and from the colony (A. Froneman in litt.). Consequences of this are that colonies are usually destroyed (either through nest removal or tree cutting) without proper intervention or guidance from relevant authorities. There are no formal regulations or systematic guidelines in place to ensure that these situations are handled in a proper manner. In South Africa, however, Harebottle et al. (2019) have developed national guidelines to assist affected parties and provincial authorities in identifying and mitigating problematic colonies. Similar initiatives in other African countries, particularly where large heronries are under threat from human disturbance, should be considered. Nesting habitat enhancement has been carried out in South Africa (Harrison et al. 2001, Harrison 2005), by building artificial platforms for colonially nesting waterbirds. These have been constructed to replace natural sites that were not being used or were destroyed, and to attract species to breed in new areas. The platforms have been used to varying degrees of success but generally birds respond positively to these artificial nesting structures (Harrison et al. 2001, Harrison 2005). Management and maintenance of the platforms or structures are required to ensure sustainability of breeding populations on an annual basis. Mitigating human-wildlife conflict situations for colonial waterbirds may involve increased focus on constructing artificial breeding sites, particularly where threatened species are present and/or large, natural sites are under increasing threat (Perennou *et al.* 1996, Harrison *et al.* 2010).

The breeding pair estimates across all species within each country gleaned from this study should be interpreted cautiously. They are based solely on submitted information, and in light of missing data from other colonies, are gross under-estimations. At best, the figures given in this study should be regarded as an initial attempt to gauge the relative importance of breeding sites and abundance in each country. For colonial waterbirds, numbers of nests per active colony usually relate to breeding success (Perennou et al. 1996). This is driven largely by the number of pairs (within species and across species) that can build nests (nest site availability) and raise chicks. HeronryMAP:Africa will attempt to monitor breeding numbers and output as part of its long-term objectives.

Continued data collection, analysis and site assessments are critical to identify and document additional sites, determine their status and potential productivity, and assess the degree of risk to the future of the sites from habitat loss, climate change, human-wildlife-conflict and other conservation threats. The use of modern technology is crucial to collect high-quality data rapidly; this is important given the real possibility that, in the absence of any formal regulations, large and potentially important colony sites may be subject to disturbance and destruction. In South Africa, the development of mobile applications, such as BirdLasser (https://www.birdlasser.com) allows for project specific data to be collected; Bird-Lasser incorporates a HeronryMAP:Africa function which prompts users to add additional information (including colony name, breeding status of each species, etc.) when they log any of the species listed in Appendix 1.

Future long-term priorities for HeronryMAP:Africa will be to identify, census and prioritize sites at national and regional levels. This should be based on a set of criteria that will include the number of each species at the colony, conservation status of the site, species of greatest conservation need and threats to the colony. This will focus attention on important colonies and particularly those threatened by human disturbance. In addition, prioritization of heronries will enable conservation authorities to include these nesting sites in national or regional conservation planning programs. Kushlan et al. (2002) and Kushlan (2007) emphasize that where nesting habitat for colonial waterbirds is limiting, these habitats need to be protected and managed effectively to ensure survival of healthy populations. A broader landscape-habitat approach may need to be considered as part of the HeronryMAP:Africa project to ensure habitats and sites can be identified and managed, which may include the need to set up alternative, man-made sites; Perennou et al. (1996) and Kushlan et al. (2002) stress that the importance of artificial nesting sites should not be underestimated. In addition, the impact of climate change on wetland hydrology needs to be investigated as it may affect habitat quality, availability of nest sites and the timing of nesting and migration (Kushlan et al. 2002). Climate change may ultimately impact negatively on priority sites and birds may be forced to source alternative, potentially inferior sites as future breeding colonies. Kushlan (1993) identified colonial waterbirds as effective bioindicators of environmental change and HeronryMAP:Africa could be an effective data source to further elucidate how colonial waterbirds will respond to environmental change.

This study has highlighted the power of citizen-

science and the use of social media in creating awareness and garnering biodiversity data for conservation outcomes. McKinley et al. (2017) and Sullivan et al. (2017) both highlight the importance of citizen-science and open access data in providing adequate information for species conservation action and natural resource management. Newman et al. (2017) argue that growth in technologies, particularly mobile applications, has the potential to expand the frontiers of social media and citizen-science to advance scientific research programs; they further elaborate that socio-cultural issues will likely influence citizenscience programs in the future as more biodiversity issues become linked to landscape and habitat changes. This is particularly relevant to this project as breeding sites may increasingly occur in local villages or areas of higher population densities resulting in potential human-wildlife conflict but also in opportunities for local citizenscience participation. In addition, access to social media platforms and technologies may be limited in parts of Africa (e.g. central and northern Africa) and which resulted in a lack of response and hence no data submissions for this study. Ultimately, long-term funding is pivotal to ensure that the HeronryMAP:Africa project can be effectively coordinated and managed into the future, where new or existing technologies for data collection can be implemented and coverage widened to include gap areas.

A long term outcome for HeronryMAP:Africa will be the production of an 'Atlas of African Heronries' which can serve as a valuable conservation resource. HeronryMAP:Africa, however, should be seen as an ongoing, long-term initiative to monitoring breeding populations of colonial waterbirds and species as well as implementing conservation action at both local and regional scales. The project also has the potential to provide improved species population estimates at country or regional levels which can contribute to Wetlands International's Waterbird Population Estimates (Wetlands International 2012).

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Appendix 1. The 31 colonial waterbird species that were considered in determining colonial sites for this study. Nomenclature after Gill and Donsker (2018); global status taken from IUCN (2017). LC = Least Concern, VU = Vulnerable, EN = Endangered. Country codes: BW – Botswana, CV – Cape Verde, GM – The Gambia, KE – Kenya, LS – Lesotho, MG – Madagascar, ML – Mali, NA – Namibia, SZ – Eswatini (formerly Swaziland), TZ – Tanzania, UG – Uganda, ZA – South Africa, ZW – Zimbabwe. Heronries in Senegal and Mauritania did not report any species specific information and are therefore not included here.

Common name	Scientific name	Global IUCN status	Country of occurrence during study
African Darter	Anhinga rufa	LC	GM, TZ, ZA
Reed Cormorant	Microcarbo africanus	LC	GM, LS, ZA, ZW
Crowned Cormorant	Microcarbo coronatus	NT	ZA
White-breasted Cormorant	Phalacrocorax lucidus	LC	GM, LS, ZA
Slaty Egret	Egretta vinaceigula	VU	NA, ZW,
Black Heron	Egretta ardesiaca	LC	BW, GM, MG,
Little Egret	Egretta garzetta	LC	BW, ZA
Western Reef Heron	Egretta gularis	LC	GM, ML
Dimorphic Egret	Egretta dimorpha	LC	MG
Intermediate Egret	Ardea intermedia	LC	BW, GM, ZA
Great Egret	Ardea alba	LC	BW, GM, MG, ML, ZA
Grey Heron	Ardea cinerea	LC	BW, KE, LS, TZ, ZA
Black-headed Heron	Ardea melanocephala	LC	BW, GM, LS, UG, ZA
Goliath Heron	Ardea goliath	LC	BW, KE, ZA
Purple Heron	Ardea purpurea	LC	CV, LS, ZA
Humblot's Heron	Ardea humbloti	EN	MG
Western Cattle Egret	Bubulcus ibis	LC	BW, GM, KE, MG, ML, NA, TZ, UG, ZA, ZW
Squacco Heron	Ardeola ralloides	LC	BW, KE, MG, TZ, ZA
Malagasy Pond Heron	Ardeola idae	EN	KE, MG
Rufous-bellied Heron	Ardeola rufiventris	LC	BW, NA
Striated Heron	Butorides striata	LC	ZA
Black-crowned Night Heron	Nycticorax nycticorax	LC	BW, GM, KE, LS, TZ, ZA
White-backed Night Heron	Gorsachius leuconotus	LC	BW, GM, KE, TZ, SZ, ZA
White-crested Tiger Heron	Tigriornis leucolopha	LC	GM
Little Bittern	Ixobrychus minutus	LC	BW, GM, MG, ZA
Dwarf Bittern	Ixobrychus sturmii	LC	GM, KE
African Sacred Ibis	Threskiornis aethiopicus	LC	BW, GM, KE, NA, UG, ZA, ZW
Malagasy Sacred Ibis	Threskiornis bernieri	EN	MG
African Spoonbill	Platalea alba	LC	BW, GM, MG, UG, ZA
Yellow-billed Stork	Mycteria ibis	LC	GM, MG, UG, ZA
Marabou Stork	Leptoptilos crumenifer	LC	GM

Appendix 2. Sample data Excel forms that were made available to observers for the collection of heronry data for this study: (a) The first version of the data form that was used in the early part of the study; (b) A streamlined modified version of (a) and is the current version that is used.

**(a)** 

<u>HeronryMAP - Africa</u> Census Form - Ver. 1									
Please email this form to: dm.harebottle@gmail.com Project coordinator: Dr Doug Harebottle									
Census Information									
Name of site:	Tweeriverien Farm								
	Small farm dam on a gravel road approximately 10 km outside the town of Zastron, Free State Province in a NW direction.								
Additional info:	Coordinates: -27.0578935; 30.2708211								
Name of observer:	Doug Harebottle								
ADU observer code:	73 If you do not have an ADU Observer code click on this link to register. http://www.adu.org.za/register.php								
Names of additional observ	ers (if applica	ble): <i>(initials an</i>	d surnane e.g.	. D. Harebottle	)				
A. Bongani, F. Smith									
Date of survey:	Day	Month	Year						
	10	11	2014						
Starting time (HH:MM)	11:12								
Finishing time (HH:MM)	11:30								
Has this site been counted	No								
Type of count:	On foot			Optic	al aids used:	Binoculars	and 20-60 x Spotting Scope		
Count conditions:	Good				Weather:	Clear, with	a light breeze		
Fixed-point photos:	ixed-point photos: Yes Other photos? No								
If yes, please submit your pho	otos in digital fo	ormat (jpg, png, ti	iff) together with	h your census fo	orm. Images s	hould be 1M	B or less in size.		
Are the nests of different species mixed or in discrete areas? Mixed									
Comments:									
The nests are located in a Willow tree on a small island in the middle of the dam. The herons occupy most of the top strata of the tree with the cormorants in the lower strata.									
Species	Spp. No.	Total no. nests	No. nests with eggs	No. nests with chicks	No. of adults	No. of juveniles	of Comments <i>(optional)</i> iles		
Grey Heron	54	1		1	2				
Black-headed Heron	55	13		10	20	3	Three juveniles were seen standing on branch	es away from nests	
Reed Cormorant	50	10	10		25				
Select species									
Select species									
Select species									

Accessed 3 December 2018.

**(b)** 

Site name - choose an appropriate site name

Latitude (S/N) - decimal degrees preferred e.g. -28.1234. Deg/Min/Sec can also be given.

Longitude (E/W) - decimal degrees preferred e.g. 24.4567. Deg/Min/Sec can also be given.

**Country name** 

Site ownership - public/private

Conservation status - protected/unprotected/unknown

Site status - active/inactive/historical

Site location- natural/artificial

Species name - for species confirmed breeding (sitting on nests/feeding chicks)

Maximum nests observed - an estimate can be provided if counting is difficult or challenging

Date of observation - use the following format, dd-mm-yyyy

**Conflict issues** - none, unknown, hunting of adults/chicks, trees cut down, nest/eggs destroyed, eggs collected, mixed conflicts, other?

Other comments - provide any additional comments that you think are noteworthy

Observer name - First name + Surname

Observer email - provide a primary email address, and where possible, a secondary email address

Appendix 3. Photos of selected colonies included in the HeronryMAP:Africa database.



Breeding colony of Western Cattle Egrets (*Bubulcus ibis*) located outside Sekororo Hospital, Louis Trichard, Limpopo province, South Africa. September 2013. (Photo credit: Birding Limpopo)



White-breasted Cormorant (*Phalacrocorax lucidus*) breeding colony, Paarl Bird Sanctuary, Paarl, Western Cape province, South Africa. March 2007. (Photo credit: Doug Harebottle)



Mixed colony of Black-headed Heron (*Ardea melanocephala*), Western Cattle Egret (*Bubulcus ibis*) and African Sacred Ibis (*Threskiornis aethiopicus*), Paarl Bird Sanctuary, Paarl, Western Cape province, South Africa. March 2003. (Photo credit: Doug Harebottle)



Human-wildlife conflict. Volunteers assisting in rescuing Western Cattle Egret (*Bubulcus ibis*) chicks from a breeding site at Port Elizabeth airport, Eastern Cape province, South Africa, after the tree in which the birds were nesting was covered in shadecloth. These birds were posing a potential risk to aircraft and the action taken was to encourage the adult birds to move away from the breeding site. (Photo credit: Luc Hosten)