

## SPECIALIST AVIFAUNAL STUDY

### DARVILL WASTE WATER TREATMENT WORKS CONSTRUCTED WETLAND PROJECT



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9 February 2016

**Declaration of independence**

I, David Allan, hereby confirm my independence as a specialist and declare that I do not have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which I was appointed as Avifaunal Specialist in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for work performed, specifically in connection with the SPECIALIST AVIFAUNAL STUDY - DARVILL WASTE WATER TREATMENT WORKS CONSTRUCTED WETLAND PROJECT, Kwazulu-Natal. I further declare that I am confident in the results of the study undertaken and conclusions drawn as a result of it – as is described in my report.

Signed:



Date: 9 February 2016

**Details of the person who carried out the specialist study and prepared the report**

David Allan is the Curator of Birds at the Durban Natural Science Museum. He has been employed in this position for almost 20 years. Prior to this he worked for nine years as a Research Officer and a Senior Scientific Officer at the Percy FitzPatrick Institute for African Ornithology and the Avian Demography Unit respectively at the University of Cape Town. His ornithological career started when he worked over a seven-year period, initially as a Nature Conservation Officer, and latterly as a Nature Conservation Scientist, with the then Transvaal Division of Nature Conservation. His highest academic qualification is a MSc. in Zoology from the University of Cape Town. His formal registration as a Professional Natural Scientist (Zoological Science) with the South African Council for Natural Scientific Professions is currently pending. A more detailed CV can be provided if required.

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**DARVILL WASTE WATER TREATMENT WORKS CONSTRUCTED WETLAND PROJECT**

**EXECUTIVE SUMMARY**

*Darvill Waste Water Treatment Works is a long-established and important sanctuary for birds, specifically waterbirds. It is popular with birdwatchers and also has a long tradition as a bird-ringing site of scientific and teaching importance especially relevant to the local university.*

*The aim of the current study is to collate and review existing information on the avifauna of Darvill and to 'ground-truth' and update this information by conducting brief but comprehensive field avifaunal surveys at the site. Some conclusions and management-related considerations and recommendations are also provided.*

*The key relevant habitats identified and examined at Darvill are the four maturation ponds, the lower dam, the lower canals, the river section (along the Msunduzi River), the potential site for the constructed wetland and the upper pastures. It is the first four of these, i.e. the wetland habitats exploited by waterbirds, that are the most important from an avifaunal perspective.*

*The existing information drawn on by this study comes mainly from the Birds in Reserves Project (BIRP) and Co-ordinated Waterbird Counts Project (CWAC), both of the Animal Demography Unit of the University of Cape Town. Specifically, BIRP provides 165 bird checklists covering Darvill and CWAC has six useable waterbird counts for the locality. Seven field surveys between November 2015 and February 2016, which included both compiling comprehensive checklists and conducting waterbird counts, were made as part of this investigation.*

*Relevant to the general avifauna of Darvill, data from all these sources show that a total of 259 bird species have been recorded at Darvill. Of these, 90 species, or over a third (35%), can be considered as waterbirds. A total of 71 species have been confirmed breeding at the site and 31 of these (44%) are waterbirds.*

*Concerning waterbirds, the waterbird counts show that a total of 61 waterbird species have been counted at Darvill during all counts combined at an average of 31 species per count (range 7-40 species). The average total number of waterbirds counted during these counts is 729 (Range 191-1263 birds).*

*Based on data collected during this survey, the four maturation ponds support the both the highest species richness and numerical abundance of waterbirds. These ponds clearly provide the most important wetland and waterbird features at Darvill. The lower canals show the next highest species richness of waterbirds but not the highest abundance, being exceeded in this regard by both the upper pastures and the lower dam. Both of the last two habitats are characterized by occasionally supporting relatively high numbers of a restricted diversity of generalist waterbird species. The remaining two habitat types, the Msunduzi River and 'other' habitat regions, evidence both low species richness and numerical abundance.*

*The number of Red Data species (nine) recorded at Darvill is relatively low and the site is clearly not a major refuge for formally threatened bird species. Only two Red Data species, Grey Crowned Crane and African Marsh Harrier - both wetland species, show any indication of being regularly recorded at Darvill. Another wetland species - the Greater Painted-snipe, however, is a fairly cryptic denizen of emergent wetland vegetation, a habitat type well represented at the maturation ponds, and this*

*species may be present more frequently than the information at hand would suggest. Breeding has not been confirmed at Darvill of any of these Red Data species. Seven of the nine Red Data species are waterbirds, suggesting that it is the wetland habitats at Darvill that are the most important for threatened birds.*

*The area identified for the proposed constructed wetland project currently comprises open rank grassland with scattered trees and shrubs. It is a fairly disturbed terrestrial area of less avifaunal importance compared with the wetland habitats. The transformation of this area into additional wetland habitat would appear positive. Careful planning, however, should go into maximizing the potential value of this additional wetland habitat by rendering the habitats created of optimal value to waterbirds. The involvement of suitably qualified wetland and waterbird specialists in this regard is recommended.*

*Several management recommendations are provided relevant to the maturation ponds to enhance the habitat and waterbird diversity at these sites, and to increase the attractiveness of these key birdwatching areas for visitors. Any future developments at Darvill should endeavour to accommodate the long-established bird-ringing effort such that its long-term value is not threatened or compromised in any way.*

## SPECIALIST AVIFAUNAL STUDY

### DARVILL WASTE WATER TREATMENT WORKS CONSTRUCTED WETLAND PROJECT

#### **1 –INTRODUCTION & AIMS**

The maturation ponds and surrounding area at Darvill Waste Water Treatment Works (hereafter simply referred to as 'Darvill') have long supported an avifauna attractive to birdwatchers. In particular, the site serves as a significant refuge for waterbirds. Indeed the site is widely known as 'Darvill Bird Sanctuary' amongst such hobbyists. In addition, Darvill has served as a long-term bird-ringing (or 'bird-banding') site of significant scientific and student-training value, especially for the local university: the University of KwaZulu-Natal (UKZN). From an avifaunal perspective, Darvill's recreational, scientific, teaching and conservation value now stretches back over many decades.

The aim of the current study is to collate and review existing information on the avifauna of Darvill and to 'ground-truth' and update this information by conducting brief but comprehensive field avifaunal surveys at the site. Additional information is also provided relevant to issues such as the popularity of the site to birdwatchers, its value as a bird-ringing locality and the presence of Red Data species. This information hopefully will be of value in expressly detailing the precise avifaunal importance of Darvill from a recreational, scientific, teaching and conservation perspective. Some conclusions and management-related considerations and recommendations are also provided.

#### **2 – GENERAL DESCRIPTION OF THE PROJECT AREA**

Figure 1 provides a satellite image (extracted from Google Earth) of Darvill with the avifaunal locality features relevant to this study depicted.





Figure 1. Satellite image of Darvill Waste Water Treatment Works showing the delineated localities of relevance to this avifaunal study. These are: the four maturation ponds (Ponds 1 – 4), the lower dam, the lower canals, the river section (along the Msunduzi River), the potential site for the constructed wetland and the upper pastures.

### 2.1 Maturation ponds

There are four maturation ponds at Darvill (Figures 1) and these provide the primary habitat for waterbirds at the site.

Pond 1 is the uppermost (and the smallest) pond and comprises open water with a narrow fringe of emergent wetland vegetation (Figure 2). This emergent vegetation comprises primarily *Typha* bulrushes but other emergent vegetation types, such as sedges and *Pericaria*, are also present, as is also the case with the other ponds.





**Figure 2. A view of Pond 1 from the east looking west showing the primarily open-water nature of this pond with only a narrow fringe of emergent vegetation mainly *Typha* bulrushes.**

Pond 2 is the most densely vegetated pond and is thickly covered in bulrushes with only a restricted central area of open water (Figure 3). There is also a small patch of *Phragmites* reeds in the north-east corner of this pond.



**Figure 3. A view of Pond 2 from the south-east corner looking north showing the densely vegetated nature of this pond. This emergent vegetation primarily comprises bulrushes but the small patch of *Phragmites* reeds in the north-east corner of this pond is visible in the extreme upper right of this photo.**

Pond 3 comprises primarily open water with a narrow fringe of emergent vegetation (Figure 4). There is, however, also fairly extensive coverage by emergent bulrushes extending into the western interior area of this pond.



**Figure 4. A view of Pond 3 from the south-east corner looking north-west showing the primarily open-water nature of this pond with only a narrow fringe of emergent vegetation.**

Pond 4 is the lowermost pond (and with Pond 3 is one of the largest ponds) and, like Pond 3, comprises primarily open water with a narrow fringe of emergent vegetation, yet again primarily bulrushes (Figure 5). Like Pond 3, there is also fairly extensive coverage by emergent bulrushes extending into the interior area of this pond but in the case of this pond in the eastern interior area of the pond.



**Figure 5. A view of Pond 4 from the south-east corner looking north-west showing the primarily open-water nature of this pond but with fairly extensive emergent vegetation extending into the eastern interior of this pond as visible in the foreground and extreme right of this photo.**

The vegetation along the berm walls between the ponds is particularly tall and dense; indeed by late summer is virtually impenetrable (especially due to the widespread presence of stinging nettles).

## **2.2. Lower canals**

Below and to the north (and west) of the maturation ponds lie a series of canals that are connected to both the main waste-water works and the lower dam (Figure 1). These canals ultimately drain into the Msunduzi River. The canals are constructed of concrete (Figure 6). In some places they are fringed with tall emergent vegetation, e.g. bulrushes, and there are also fairly extensive patches of floating vegetation in places along these canals – habitats attractive to waterbirds (although this vegetation is regularly subjected to clearance by the staff at the site so that these canals do not become choked with such vegetation). Other sections of the canals are fringed with short grass lawns, which also provide fairly attractive roosting sites for waterbirds along the edges of the canals.





**Figure 6. A view of the lower canals, showing the edges vegetated with emergent bulrushes in some places and shorter grass in others, with some areas of floating vegetation along the edges of the canals also visible.**

### **2.3 Lower dam**

The lower dam (Figure 1) was found to comprise largely open water during the field surveys but on the last survey this dam was virtually drained suggesting that water levels are intensively managed at this dam. The surrounding shorelines were largely exposed and were mainly bordered by the edges of dumped piles of rubble/earth in the north, a concrete edge in the south and short grassed areas in the east and west (Figure 7). The water quality appeared particularly poor in this dam.



**Figure 7. The lower dam showing the typically open-water nature of this waterbody and the largely exposed shorelines.**

### **2.4 River**

The river section covered during this survey comprised a length of the Msunduzi River lying north of the maturation ponds and the lower canals (Figure 1). The river course itself is quite deeply incised, with numerous sheer earth banks, and is otherwise fringed with grass and emergent aquatic vegetation, as well as shrubs and trees (Figure 8).



**Figure 8.** A section of the Msunduzi River covered during this survey showing the deeply incised nature of this watercourse, with sheer earth banks, otherwise fringed with grass and emergent aquatic vegetation, as well as shrubs and trees.

#### **2.6 Potential site for constructed wetland**

The potential site for the constructed wetland is situated in the 'oxbox curve' of the Msunduzi River (Figure 1). The habitat of this area comprises open rank grassland with scattered trees and shrubs both indigenous and alien (Figure 9).



**Figure 9.** View of the potential site for the constructed wetland showing the largely open grassland with scattered trees both indigenous and alien characteristic of this area.

#### **2.7 Upper pastures**

The upper pastures are situated directly to the south of the maturation ponds, and abut directly onto Pond 1 (Figure 1). This artificial habitat comprises short irrigated cultivated pastures managed for commercial purposes (Figure 10).





**Figure 10. A view of the upper pastures showing the cultivated grass pastures, with attendant waterbirds in the form of Egyptian and Spur-winged geese, and African Sacred and Hadedda ibises.**

### **3 – METHODOLOGY**

Bird common and scientific names, and systematic ordering, in this report follow Hockey *et al.* (2005).

#### **3.1 Existing avifaunal information**

##### **Data from the Birds in Reserves Project (BIRP)**

The database of the Birds in Reserves Project (BIRP) of the Animal Demography Unit at the University of Cape Town (see: <http://birp.adu.org.za/>) has 165 bird checklists specifically covering Darvill. This information has been relied on here to provide comprehensive detail on the diversity and relative abundance of the Darvill avifauna. Relevant to the latter measure, the BIRP data provide ‘reporting rates’ for each species, i.e. the number of records of each species relative to the total number of checklists for the site expressed as a percentage – a measure of relative abundance

Data from the first (Harrison *et al.* 1997; see also: <http://adu.org.za/sabap1.php>) and second (see: <http://sabap2.adu.org.za/>) Southern African Bird Atlas Projects (SABAP) are often typically used in studies such as these but in this instance these data are deemed to cover areas too expansive, quarter-degree-grid squares (15’ X 15’) in the former project and ‘pentads’ (5’ X 5’) in the latter, relevant to the restricted extent of Darvill itself, especially in the light of the availability of the fairly extensive and highly specific information contained in the BIRP database.

##### **Data from the Co-ordinated Waterbird Counts Project (CWAC)**

The database of the Co-ordinated Waterbird Counts Project (CWAC) of the Animal Demography Unit at the University of Cape Town (see: <http://cwac.adu.org.za/>) ostensibly has information from eight waterbird counts made at Darvill in the period between March 2012 and August 2015 (specifically: March and August 2012, January and August 2013, February and July 2014, and February and August 2015). The count for July 2014, however, seems incomplete as the only waterbirds it reports from the site are 59 Egyptian Geese. The ‘count’ dated 12 August 2015 is even more anomalous as details of any waterbirds actually counted are entirely lacking, although the count data reports that “There were CWAC species present”. Due to the obviously incomplete nature of these last two counts, only the data from the other six counts are of value here.

##### **Red Data species**

Information on globally threatened and near-threatened Red Data bird species was obtained from: [http://www.birdlife.org/datazone/speciessearchresults.php?reg=0&cty=194&cri=CR+EN+VU+NT&fam=0&gen=0&spc=&cmn=&hab=&thr=&bt=&rec=N&vag=N&hdnAction=ADV\\_SEARCH&SearchTerms.](http://www.birdlife.org/datazone/speciessearchresults.php?reg=0&cty=194&cri=CR+EN+VU+NT&fam=0&gen=0&spc=&cmn=&hab=&thr=&bt=&rec=N&vag=N&hdnAction=ADV_SEARCH&SearchTerms.)



Information on nationally threatened and near-threatened bird species was extracted from Taylor *et al.* (2015).

### **3.2 Field surveys**

Seven separate field visits were made to Darvill as part of this survey. On each visit a bird checklist for the site was completed and counts were made of the waterbirds present. These count data were collected separately for each of the key waterbird sections present (essentially as described in Section 2 above).

The first visit, a general site-familiarisation and Health-and-Safety induction visit, was made on 20 November 2015. During this visit only waterbirds counted at the four maturation ponds and immediately surrounding area were counted, i.e. the lower canals, lower dam, river and upper pasture sections were not counted (or visited).

The second visit was made the next day (21 November 2015) and during this visit waterbirds at all the wetland sections were counted except for the river section which was not visited.

On the remaining five visits (29 November and 23 December 2015, 10 and 23 January, and 7 February 2016) all of the wetland sections were covered in the waterbird counts.

## **4 – ASSUMPTIONS AND LIMITATIONS**

The information on the general avifauna at Darvill coming from the BIRP dataset can be considered relatively comprehensive and reliable. The total of 165 checklists is relatively large and coverage is fairly even throughout the year (11-18 checklists per month).

Two of the eight CWAC counts seem anomalous as discussed above. Relevant to the other six counts, it is not clear which sections of Darvill were covered during these counts but it seems likely that only the maturation ponds (and likely immediately adjacent areas) were covered.

During the course of the field trips made during this survey attempts were made to cover all the habitats present at Darvill while compiling the bird checklists. The visits to Darvill, however, were biased towards coverage of the wetland areas, particularly associated with the comprehensive waterbird counts made. This survey, both in terms of the bird checklists compiled and waterbirds counts made, spanned only the peak summer period, November-January, with no coverage of other seasons. This shortcoming, however, is at least partially compensated for by the more even coverage of the BIRP and CWAC data.

## **5 – DESCRIPTION OF THE AVIFAUNA**

### **5.1 General avifauna**

The 165 bird checklists from the BIRP database provide a total list of 255 bird species as having been recorded at Darvill during the course of that project. Of these, 88 species (35%) can be classified as 'waterbirds'. In addition, 71 species have been confirmed breeding at Darvill. Appendix 1 provides a list of the common and scientific names of these 255 species, as well as the reporting rate, a measure of relative abundance, for each species. Appendix 1 also identifies which of these species are waterbirds and also identifies species confirmed breeding during the BIRP (and CWAC) projects.

A total of 151 bird species were recorded at Darvill on the seven checklists compiled during the same number of field surveys made during this survey (see also Appendix 1). Only four of these species (Black Cuckoo, Green Sandpiper, Black Heron and Olive Thrush) do not occur on the BIRP list for Darvill; two of these are waterbirds: Green Sandpiper and Black Heron. A total of 24 species were recorded as breeding or possibly breeding at Darvill during this survey (Appendix 1). Of these, two

species (Grey Crowned Crane and Goliath Heron) were not confirmed breeding during the BIRP project. The behaviour of two Grey Crowned Cranes in the area of maturation Ponds 1 and 2 suggested that they may have attempted breeding in Pond 2. A pair of adult Goliath Herons accompanied by three flying juveniles at Pond 4 suggested that the species had bred in the area.

In summary, the data from BIRP (and CWAC) and this study provide a list of 259 bird species as having been recorded at Darvill. Of these, 90 species, or over a third (35%), can be considered as waterbirds. A total of 71 species have been confirmed breeding at the site and 31 of these (44%) are waterbirds.

### 5.2 Aquatic avifauna (waterbirds)

Appendix 2 provides details of the waterbird counts made at Darvill as part of the CWAC Project. Only details from the six apparently complete counts are presented (see above), spanning the period March 2012 – February 2015.

Appendices 3-9 provide details of the seven waterbird counts made as part of this study, spanning the period November 2015 – February 2016, with the data presented separately for each separate wetland section.

Table 1 summarizes and compares the information from the six CWAC counts and the seven counts made as part of this study.

**Table 1.** A summary and comparison of the information from the waterbird counts done as part of the CWAC Project (n=6 counts; March 2012 – 13 February 2015) and during this survey (n=7 counts; November 2015 – February 2016). Avg = Average count; Max = Maximum count.

Common name	CWAC		This study		Combined	
	Avg	Max	Avg	Max	Avg	Max
Fulvous Duck	0.2	1	0.1	1	0.2	1
White-faced Duck	23.8	63	45.7	69	35.6	69
White-backed Duck			0.3	2	0.2	2
Egyptian Goose	122.0	309	60.0	93	88.6	309
South African Shelduck			1.0	2	0.5	2
Spur-winged Goose	8.5	39	10.0	17	9.3	39
Cape Teal	6.8	20			3.2	20
African Black Duck	1.0	3	0.9	3	0.9	3
Yellow-billed Duck	28.3	92	12.9	25	20.0	92
Cape Shoveler	1.2	4	1.4	5	1.3	5
Red-billed Teal	32.2	82	17.9	25	24.5	82
Hottentot Teal	20.0	45	12.4	23	15.9	45
Southern Pochard	0.7	3	0.7	4	0.7	4
Malachite Kingfisher			1.1	4	0.6	4
Giant Kingfisher			0.1	1	0.1	1
Pied Kingfisher			0.1	1	0.1	1
Grey Crowned Crane	0.2	1	1.7	6	1.0	6
African Rail			2.7	4	1.5	4
Black Crake	4.3	8	10.9	15	7.8	15
Baillon's Crake			0.1	1	0.1	1
African Purple Swamphen	0.2	1	2.9	9	1.6	9
Common Moorhen	4.0	9	28.1	52	17.0	52
Red-knobbed Coot	4.3	10	5.9	20	5.2	20
African Snipe	1.2	5	3.6	8	2.5	8
Common Greenshank	0.2	1			0.1	1
Green Sandpiper			0.3	1	0.2	1

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<b>Common name</b>	<b>CWAC</b>		<b>This study</b>		<b>Combined</b>	
	<b>Avg</b>	<b>Max</b>	<b>Avg</b>	<b>Max</b>	<b>Avg</b>	<b>Max</b>
Wood Sandpiper	18.3	49	29.1	39	24.2	49
Common Sandpiper	1.3	3	3.0	6	2.2	6
Little Stint	1.8	9			0.8	9
Ruff	17.7	41	7.9	26	12.4	41
African Jacana	1.2	4	19.4	44	11.0	44
Black-winged Stilt	20.3	64	1.9	4	10.4	64
Common Ringed Plover	0.3	2			0.2	2
Kittlitz's Plover	5.3	18	0.9	6	2.9	18
Three-banded Plover	2.7	8	7.0	16	5.0	16
Blacksmith Lapwing	46.8	90	169.9	414	113.1	414
African Fish-Eagle	0.7	1	0.7	3	0.7	3
African Marsh-Harrier	0.2	1	0.9	3	0.5	3
Little Grebe	14.7	41	141.0	274	82.7	274
African Darter	0.5	2	0.3	1	0.4	2
Reed Cormorant			0.9	3	0.5	3
White-breasted Cormorant	0.2	1	0.4	2	0.3	2
Black Heron			0.1	1	0.1	1
Little Egret			0.2	1	0.1	1
Yellow-billed Egret	0.2	1	1.0	4	0.6	4
Great Egret			0.1	1	0.1	1
Grey Heron	0.8	3	4.4	18	2.8	18
Black-headed Heron	6.0	22	3.6	9	4.7	22
Goliath Heron	0.7	2	3.6	6	2.2	6
Purple Heron			0.3	1	0.2	1
Cattle Egret	41.5	100	60.6	182	51.8	182
Squacco Heron	0.3	1	3.4	7	2.0	7
Little Bittern			0.7	2	0.4	2
Hamerkop	0.3	1	1.0	5	0.7	5
Hadedda Ibis	29.7	76	59.3	173	45.6	173
African Sacred Ibis	110.0	233	56.0	106	80.9	233
Woolly-necked Stork			0.3	1	0.2	1
White Stork	2.0	12	37.6	140	21.2	140
African Pied Wagtail	2.0	4	0.9	2	1.4	4
Cape Wagtail	6.2	9	6.3	9	6.2	9
Yellow Wagtail	0.3	2			0.2	2

A total of 46 waterbird species have been counted at Darvill during the CWAC counts at an average of 25 species per count (range 7-34 species; Appendix 2 and Table 1). The average total number of waterbirds counted per CWAC count is 591 (Range 191-917 birds). It should be noted that the 13 February 2015 count was particularly low (191 individuals of only 7 species compared with 516-917 individuals of 27-34 species on the other five counts).

A total of 56 waterbird species were counted at Darvill during the counts made as part of this survey at an average of 35 species per count (range 28-40 species; Appendices 3-9 and Table 1). The average total number of waterbirds counted during these counts is 843 (Range 350-1263 birds). Not surprisingly the least complete count (20 November 2015) was the lowest (only 350 individuals of 28 species compared with 570-1263 individuals of 28-40 species on the other six counts).

Overall, a total of 61 waterbird species have been counted at Darvill during all these counts combined at an average of 31 species per count (range 7-40 species; Appendices 2-9 and Table 1). The average total number of waterbirds counted during these counts is 729 (Range 191-1263 birds).



Overall the results for the CWAC counts are lower in terms of both the number of waterbird species recorded and the total numbers of individuals counted compared with the counts made during this survey. This is likely due to a larger area of Darvill being counted during the latter counts.

During the waterbird counts made as part of this survey the data were collected separately for the different areas at Darvill. This allows for an examination of the differential importance of these different areas to waterbirds relevant to species richness and numerical abundance. Table 2 presents a summary outlining such a comparison.

**Table 2.** A comparison of waterbird species richness and numerical abundance between the various habitats at which waterbirds were counted at Darvill during this study.

	<b>Ponds 1-4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Upper pastures</b>	<b>Other</b>
<b>No. of counts</b>	7	6	6	5	6	7
<b>Total spp.</b>	46	31	12	15	11	20
<b>Avg no. spp./count</b>	29	17	5	6	6	5
<b>Range =</b>	21-31	11-21	2-8	2-11	2-8	3-16
<b>Avg no. inds/count</b>	417	96	132	11	216	38
<b>Range =</b>	289-564	41-124	5-307	4-21	37-342	8-65

From Table 2 various features are apparent. The maturation Ponds 1-4 support the both the highest species richness (46 species recorded) and numerical abundance (average of 417 individual waterbirds per count) of waterbirds. These ponds clearly provide the most important wetland and waterbird features at Darvill. The lower canals show the next highest species richness of waterbirds but not the highest abundance, being exceeded in this regard by both the upper pastures and the lower dam. Both of the last two habitats are characterized by occasionally supporting relatively high numbers of a restricted diversity of generalist waterbird species. Both the river and ‘other’ habitat regions evidence both low species richness and numerical abundance.

### 5.3 Red Data bird species

Table 3 lists the Red Data species recorded at Darvill during the BIRP and CWAC projects and during this study.

**Table 3.** The nine Red Data bird species, both regional (Taylor *et al.* 2015) and global, recorded at Darvill during the BIRP and CWAC projects and this study. Red Data categories are: EN – Endangered, VU – Vulnerable, NT – Near-threatened and LC – Least Concern. Habitat categories are: W – aquatic (waterbirds), F – forest and G - generalist. Breeding categories are: Poss – possibly breeds, non-breeding migrant and non-breeding visitor. Also provided are the reporting rates (‘Rep. rate’; a crude measure of abundance) for each species from the BIRP Project and this study. In addition, the average (Avg) and maximum (Max) number of individuals counted during the waterbird counts from the CWAC Project and this study are also provided.

<b>Common name</b>	<b>Red Data status</b>				<b>Rep. rate</b>		<b>CWAC</b>		<b>This study</b>	
	<b>SA</b>	<b>Int.</b>	<b>Hab.</b>	<b>Br.</b>	<b>BIRP</b>	<b>This study</b>	<b>Avg</b>	<b>Max</b>	<b>Avg</b>	<b>Max</b>
Half-collared Kingfisher	NT	LC	W	Poss	1%		0	0	0	0
Grey Crowned Crane	EN	EN	W	Poss	15%	71%	0.2	1	1.7	6
Curlew Sandpiper	LC	NT	W	Non-br migr	4%		0	0	0	0
Greater Painted-snipe	NT	LC	W	Poss	1%		0	0	0	0

Common name	Red Data status				Rep. rate		CWAC		This study	
	SA	Int.	Hab.	Br.	BIRP	This study	Avg	Max	Avg	Max
African Marsh-Harrier	EN	LC	W	Poss.	10%	57%	0.2	1	0.9	3
African Crowned Eagle	VU	NT	F	Non-br visitor	1%		N/A	N/A	N/A	N/A
Lanner Falcon	VU	LC	G	Non-br visitor	4%	14%	N/A	N/A	N/A	N/A
Yellow-billed Stork	EN	LC	W	Non-br visitor	1%		0	0	0	0
Black Stork	VU	LC	W	visitor	1%		0	0	0	0

The number of Red Data species (nine) recorded at Darvill is relatively low and the site is clearly not a major refuge for formally threatened bird species. In addition, only the Grey Crowned Crane and African Marsh Harrier, both wetland species, show any indication of being regularly recorded at Darvill. Another wetland species - the Greater Painted-snipe, however, is a fairly cryptic denizen of emergent wetland vegetation, a habitat type well represented at the maturation ponds, and this species may be present more frequently than the information at hand would suggest. Breeding has not been confirmed at Darvill of any of these Red Data species, although it is possibly that the Half-collared Kingfisher (although this river is likely too turbid for this species), Grey Crowned Crane, Greater Painted-snipe and African Marsh-Harrier could breed at the site. The kingfisher would likely breed along the Msunduzi River and other three species would be most likely to breed at the maturation ponds. Seven of the nine Red Data species are waterbirds, suggesting that it is the wetland habitats at Darvill that are the most important for threatened birds.

#### 6 – DARVILL AS A BIRDWATCHING LOCALITY

As mentioned above, Darvill has long been a popular birdwatching locality. As such, it is frequently mentioned in guides to birdwatching localities. Three examples are Bennett & Herbert (1995), Cohen *et al.* (2006) and Harker (2007). The locality accounts from these three publications are reproduced in Appendices 10-12. Cohen *et al.* (2006) state that Darvill is “perhaps Pietermaritzburg’s most frequently visited birding venue” – a theme echoed in the Hardaker (2007) account. Similar locality accounts can be found in various internet websites devoted to providing information on birdwatching localities, e.g. that of SA Birding at:

<http://wiki.sabirding.co.za/Portal.aspx?Page=Darvill&AspxAutoDetectCookieSupport=1>

and BirdLife South Africa at:

<http://www.birdlife.org.za/component/k2/item/436#darvill-resources-park>.

Birdwatchers visit Darvill either individually or in organized groups. Particularly frequent group visitors are branches of local bird clubs and during the 7 February 2016 field survey it was noted that the BirdLife KZN Midlands branch of BirdLife South Africa was busy with an outing to the site.

News of the presence of rare birds at the site often results in an influx of visitors hoping to see these vagrants. During the course of this study, the presence of Red-billed Quelea and especially Green Sandpiper (Figure 11) were noted to draw fairly large numbers of birdwatchers to Darvill over this summer period.



**Figure 11. A Green Sandpiper, a rare vagrant to Darvill and South Africa generally, photographed along the lower canals on 23 January 2016.**

In the past, hides have apparently been constructed at the maturation ponds and along the lower canals to facilitate birdwatching at these localities. Unfortunately, these hides were apparently vandalized and their construction material stolen (Ian G. Gordon pers. comm.). It is most unfortunate that such hides are not present at Darvill as the site lends itself to such facilities, especially at the maturation ponds. Perhaps the use of material impossible or unlikely to be stolen in hide construction could be investigated, e.g. placing one or more large steel containers to be used as hides.

The extremely tall and dense nature of the vegetation growing along the berm walls between the maturation ponds (especially coupled with rampant growth of stinging nettles) renders it difficult, if not impossible, to access most of these areas for birdwatching, at least during mid- to late-summer. On the positive side, however, these well-vegetated areas provide excellent breeding habitat for waterbirds, especially waterfowl (ducks and geese), as pointed out by Bennett & Herbert (1995). Perhaps some compromise position could be explored to establish and maintain some access routes along some of these berm walls, possibly using boardwalks, while leaving the remainder well-vegetated and inaccessible to humans to enhance breeding by the relevant waterbirds.

In artificial wetlands such as those present at the maturation ponds at Darvill, it is typical for emergent vegetation (reeds, bulrushes and sedges) to gradually encroach on open-water areas and exposed mudflats, and eventually entirely cover the wetland, especially where water levels are held fairly constant. In this regard it should be noted that Pond 2 is now virtually entirely covered in bulrushes. To maintain a diversity of wetland habitats it is often necessary in such circumstances to actively control the growth of emergent vegetation through varying water levels (even temporarily drying them out entirely) and the use of manual vegetation clearing and even fire. At present the maturation ponds at Darvill often little in the way of exposed open mudflats and shorelines suitable for waterbirds feeding in such habitats, especially shorebirds. Past literature on the site suggests that such habitats were more prevalent in the past. Consideration should therefore be given to



implementing management interventions designed to promote a higher diversity of wetland habitats and hence waterbird populations.

#### **7 – DARVILL AS A BIRD-RINGING LOCALITY**

As also mentioned above, Darvill has also long served as long-term bird ringing site important for both scientific research and the training of tertiary university students.

Contact was made with Dr Mark Brown, who has been one of the project leaders of this effort over many years. He confirmed that Darvill is one of the longest-running bird-ringing sites in South Africa. Ringing has been ongoing here on a monthly basis for over 30 years. He further reports that: “in terms of climate change data it is the longest running single ringing data set we have in the country, so in determining body size effects of climate change and even moult changes it has no rivals. It is also the biggest training centre in SA I think – seen more licensed ringers there in the last decade than anywhere else.”

Key people involved with the co-ordination of this ringing effort are listed below along with their contact details. These parties should be kept formally informed as ‘Interested & Affected Parties’ relevant to any major developments and changes in the management at Darvill.

Dr Mark Brown  
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During the course of this study, ringing was noted to be taking place at a ringing base located between maturation Pond 4 and the lower canals on 23 January 2016 as led by Karin Nelson.



**Figure 12. A Levallants Cisticola sporting a metal ring ('band') on its leg photographed close to one of the ringing sites between maturation Pond 4 and the lower canals during this study.**

## **8 – CONCLUSIONS AND RECOMMENDATIONS**

### **8.1 Key bird habitats at Darvill**

This investigation re-emphasizes that it is the wetland habitats at Darvill that are the most important from an avifaunal perspective. The bird populations of greatest interest and conservation value, including relevant to the Red Data species present, are waterbirds.

The area at Darvill identified for the proposed constructed wetland project currently comprises open rank grassland with scattered trees and shrubs both indigenous and alien. It is a fairly disturbed terrestrial area of less avifaunal importance compared with the wetland habitats. The transformation of this area into additional wetland habitat building on the existing base of extensive wetlands and associated waterbird populations already present would appear positive. Careful planning, however, should go into maximizing the potential value of this additional wetland habitat by rendering the habitats created of optimal value to waterbirds. The involvement of suitably qualified wetland and waterbird specialists in this regard is recommended.

### **8.2 Darvill as a bird sanctuary**

Darvill has a long tradition as an important sanctuary for birds, specifically waterbirds, and it currently retains this value. Although the diversity, particularly in terms of Red Data species, and numbers of birds, especially waterbirds, are not high enough to qualify the site as a regional or global 'Important Bird and Biodiversity Area' (IBA) under the BirdLife International IBA scheme (see Marnewick *et al.* 2015, available online at: <http://www.birdlife.org.za/conservation/important-bird-areas/iba-directory>), it is indisputably a locally significant bird sanctuary.

### **8.3 Darvill as a birdwatching locality**

Darvill has long been popular with birdwatchers. This popularity is still current today and is based, at least partially, on the proximity of the site to the large city of Pietermaritzburg. At present, however, there are several factors that limit the value of Darvill to birdwatchers, as mentioned above. The heavily overgrown vegetation along the entire lengths of the berm walls between the maturation ponds currently limits and indeed even denies access to this key birdwatching area, although this

habitat is also important for breeding waterbirds and some balance is called for in this regard. As discussed in more detail above, consideration should also be given to enhancing the diversity of wetland habitats and waterbirds present at the maturation ponds by controlling the growth of emergent vegetation and increasing the extent of exposed mudflats and shorelines. The absence of hides or viewing platforms is another limiting factor to the popularity of the site. There are various other potential initiatives that could also be considered relevant to enhancing the attractiveness of the site to birdwatchers, e.g. signage, pamphlets and annotated bird lists, trained bird guides, etc. The local bird club (BirdLife KZN Midlands; current Chairman Peter Divall, tel 033-2395537, cell 083-2634169, email [pdivall@mweb.co.za](mailto:pdivall@mweb.co.za)) could be liaised with in this regard and they should also be regarded as an 'Interested and Affect Party' relevant to any future developments at Darvill.

#### **8.4 Darvill as a bird-ringing site**

Darvill supports a long –established bird-ringing site of scientific and teaching importance, especially to the local university. Any future developments at Darvill should endeavour to accommodate this ongoing ringing effort such that its long-term value is not threatened or compromised in any way.

#### **9 - REFERENCES**

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**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

**Appendix 1.** The common and scientific names of the 259 bird species recorded at Darvill from the BIRP project (and CWAC project) and during this study. Also provided are the reporting rates (Rep. rate) for each of the 259 species from the BIRP project (n=165 checklists) and from this study (n=7 checklists). Species considered as waterbirds are identified. In addition, species confirmed breeding during BIRP and confirmed or possibly breeding during this study are similarly identified.

Common name	Scientific name	Rep. rate		Waterbirds	Breeding	
		BIRP	This study		BIRP	This study
Shelley's Francolin	<i>Scleroptila shelleyi</i>	1%				
Natal Spurfowl	<i>Pternistis natalensis</i>	15%	14%			
Red-necked Spurfowl	<i>Pternistis afer</i>	1%				
Swainson's Spurfowl	<i>Pternistis swainsonii</i>	1%				
Common Quail	<i>Coturnix coturnix</i>	1%				
Helmeted Guineafowl	<i>Numida meleagris</i>	9%				
Fulvous Duck	<i>Dendrocygna bicolor</i>	7%	14%	Y		
White-faced Duck	<i>Dendrocygna viduata</i>	82%	100%	Y	Y	Y
White-backed Duck	<i>Thalassornis leuconotus</i>	9%	14%	Y	Y	
Egyptian Goose	<i>Alopochen aegyptiacus</i>	92%	100%	Y	Y	Y
South African Shelduck	<i>Tadorna cana</i>	3%	57%	Y		
Spur-winged Goose	<i>Plectropterus gambensis</i>	85%	100%	Y	Y	Y
Comb Duck	<i>Sarkidiornis melanotos</i>	2%		Y		
Cape Teal	<i>Anas capensis</i>	25%		Y		
African Black Duck	<i>Anas sparsa</i>	16%	57%	Y		
Yellow-billed Duck	<i>Anas undulata</i>	92%	100%	Y	Y	
Cape Shoveler	<i>Anas smithii</i>	58%	43%	Y	Y	
Red-billed Teal	<i>Anas erythrorhyncha</i>	77%	100%	Y	Y	
Hottentot Teal	<i>Anas hottentota</i>	94%	100%	Y	Y	
Southern Pochard	<i>Netta erythrophthalma</i>	18%	29%	Y		
Greater Honeyguide	<i>Indicator indicator</i>	1%				
Lesser Honeyguide	<i>Indicator minor</i>	7%			Y	
Brown-backed Honeybird	<i>Prodotiscus regulus</i>	1%				
Red-throated Wryneck	<i>Jynx ruficollis</i>	4%	43%			
Golden-tailed Woodpecker	<i>Campethera abingoni</i>	10%				
Cardinal Woodpecker	<i>Dendropicus fuscescens</i>	13%	14%			
Olive Woodpecker	<i>Dendropicus griseocephalus</i>	1%				
Black-collared Barbet	<i>Lybius torquatus</i>	30%	86%			
Crested Barbet	<i>Trachyphonus vaillantii</i>	45%	14%			
African Hoopoe	<i>Upupa africana</i>	18%	43%			
Green Wood-Hoopoe	<i>Phoeniculus purpureus</i>	2%				
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	1%		Y		
Malachite Kingfisher	<i>Alcedo cristata</i>	25%	43%	Y	Y	Y
Brown-hooded Kingfisher	<i>Halcyon albiventris</i>	24%	43%			
Giant Kingfisher	<i>Megaceryle maximus</i>	18%	14%	Y		
Pied Kingfisher	<i>Ceryle rudis</i>	21%	14%	Y		
Little Bee-eater	<i>Merops pusillus</i>	1%				
Speckled Mousebird	<i>Colius striatus</i>	65%	86%		Y	
Red-faced Mousebird	<i>Urocolius indicus</i>	6%				
Jacobin Cuckoo	<i>Clamator jacobinus</i>	1%				
Black Cuckoo	<i>Cuculus clamosus</i>		14%			
Red-chested Cuckoo	<i>Cuculus solitarius</i>	1%				
Klaas's Cuckoo	<i>Chrysococcyx klaas</i>	25%	29%			
Diderick Cuckoo	<i>Chrysococcyx caprius</i>	39%	100%		Y	
Burchell's Coucal	<i>Centropus burchelli</i>	3%	71%			
African Palm-Swift	<i>Cypsiurus parvus</i>	46%	43%			
Alpine Swift	<i>Tachymarptis melba</i>	1%				
African Black Swift	<i>Apus barbatus</i>	5%				
Little Swift	<i>Apus affinis</i>	44%	43%		Y	
Horus Swift	<i>Apus horus</i>	1%				
White-rumped Swift	<i>Apus caffer</i>	30%	43%			
Purple-crested Turaco	<i>Gallirex porphyreolophus</i>	1%				
Marsh Owl	<i>Asio capensis</i>	1%		Y		

**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

Common name	Scientific name	Rep. rate		Waterbirds	Breeding	
		BIRP	This study		BIRP	This study
Rock Dove	<i>Columba livia</i>	5%	14%			
Speckled Pigeon	<i>Columba guinea</i>	4%	14%			
African Olive-Pigeon	<i>Columba arquatrix</i>	2%				
Laughing Dove	<i>Streptopelia senegalensis</i>	22%	14%			
Cape Turtle-Dove	<i>Streptopelia capicola</i>	19%				
Red-eyed Dove	<i>Streptopelia semitorquata</i>	65%	100%			
Emerald-spotted Wood-Dove	<i>Turtur chalcospilos</i>	5%				
Tambourine Dove	<i>Turtur tympanistria</i>	22%	71%			
Namaqua Dove	<i>Oena capensis</i>	8%				
Grey Crowned Crane	<i>Balearica regulorum</i>	15%	71%	Y		?
Buff-spotted Flufftail	<i>Sarothrura elegans</i>	2%				
Red-chested Flufftail	<i>Sarothrura rufa</i>	2%		Y		
African Rail	<i>Rallus caerulescens</i>	15%	86%	Y		
Corn Crake	<i>Crex crex</i>	1%				
Black Crake	<i>Amaurornis flavirostris</i>	87%	100%	Y	Y	
Baillon's Crake	<i>Porzana pusilla</i>	3%	14%	Y		
African Purple Swamphen	<i>Porphyrio madagascariensis</i>	27%	71%	Y	Y	
Common Moorhen	<i>Gallinula chloropus</i>	87%	100%	Y	Y	Y
Red-knobbed Coot	<i>Fulica cristata</i>	82%	86%	Y	Y	
African Snipe	<i>Gallinago nigripennis</i>	21%	86%	Y		
Marsh Sandpiper	<i>Tringa stagnatilis</i>	7%		Y		
Common Greenshank	<i>Tringa nebularia</i>	8%		Y		
Green Sandpiper	<i>Tringa ochropus</i>		43%	Y		
Wood Sandpiper	<i>Tringa glareola</i>	65%	100%	Y		
Common Sandpiper	<i>Actitis hypoleucos</i>	35%	86%	Y		
Little Stint	<i>Calidris minuta</i>	16%		Y		
Curlew Sandpiper	<i>Calidris ferruginea</i>	4%		Y		
Ruff	<i>Philomachus pugnax</i>	51%	57%	Y		
Red Phalarope	<i>Phalaropus fulicaria</i>	1%		Y		
Greater Painted-snipe	<i>Rostratula benghalensis</i>	1%		Y		
African Jacana	<i>Actophilornis africanus</i>	72%	100%	Y	Y	Y
Spotted Thick-knee	<i>Burhinus capensis</i>	1%				
Black-winged Stilt	<i>Himantopus himantopus</i>	60%	71%	Y	Y	Y
Common Ringed Plover	<i>Charadrius hiaticula</i>	4%		Y		
Kittlitz's Plover	<i>Charadrius pecuarius</i>	13%	14%	Y	Y	
Three-banded Plover	<i>Charadrius tricollaris</i>	75%	100%	Y	Y	Y
Blacksmith Lapwing	<i>Vanellus armatus</i>	79%	100%	Y	Y	Y
African Wattled Lapwing	<i>Vanellus senegallus</i>	1%		Y		
Black-winged Lapwing	<i>Vanellus melanopterus</i>	2%	29%			
Crowned Lapwing	<i>Vanellus coronatus</i>	3%			Y	
Whiskered Tern	<i>Chlidonias hybrida</i>	1%		Y		
African Cuckoo Hawk	<i>Aviceda cuculoides</i>	1%				
Black-shouldered Kite	<i>Elanus caeruleus</i>	13%				
Black Kite	<i>Milvus migrans</i>	52%	100%		Y	Y
African Fish-Eagle	<i>Haliaeetus vocifer</i>	60%	43%	Y	Y	
African Marsh-Harrier	<i>Circus ranivorus</i>	10%	57%	Y		
African Harrier-Hawk	<i>Polyboroides typus</i>	10%	14%			
African Goshawk	<i>Accipiter tachiro</i>	10%				
Little Sparrowhawk	<i>Accipiter minullus</i>	1%				
Black Sparrowhawk	<i>Accipiter melanoleucus</i>	16%	29%			Y
Steppe Buzzard	<i>Buteo vulpinus</i>	22%	86%			
Jackal Buzzard	<i>Buteo rufofuscus</i>	16%	14%			
Verreaux's Eagle	<i>Aquila verreauxii</i>	1%				
Booted Eagle	<i>Aquila pennatus</i>	1%				
Wahlberg's Eagle	<i>Aquila wahlbergi</i>	1%				
Long-crested Eagle	<i>Lophaetus occipitalis</i>	42%	57%			
African Crowned Eagle	<i>Stephanoaetus coronatus</i>	1%				
Lanner Falcon	<i>Falco biarmicus</i>	4%	14%			
Peregrine Falcon	<i>Falco peregrinus</i>	4%	29%			
Little Grebe	<i>Tachybaptus ruficollis</i>	83%	100%	Y	Y	

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Common name	Scientific name	Rep. rate		Waterbirds	Breeding	
		BIRP	This study		BIRP	This study
African Darter	<i>Anhinga rufa</i>	50%	29%	Y		
Reed Cormorant	<i>Phalacrocorax africanus</i>	72%	57%	Y		
White-breasted Cormorant	<i>Phalacrocorax carbo</i>	53%	29%	Y		
Black Heron	<i>Egretta ardesiaca</i>		14%	Y		
Little Egret	<i>Egretta garzetta</i>	8%	14%	Y		
Yellow-billed Egret	<i>Egretta intermedia</i>	5%	43%	Y		
Great Egret	<i>Egretta alba</i>	7%	14%	Y		
Grey Heron	<i>Ardea cinerea</i>	67%	71%	Y	Y	
Black-headed Heron	<i>Ardea melanocephala</i>	81%	71%	Y	Y	
Goliath Heron	<i>Ardea goliath</i>	4%	86%	Y		?
Purple Heron	<i>Ardea purpurea</i>	18%	29%	Y		
Cattle Egret	<i>Bubulcus ibis</i>	65%	100%	Y		
Squacco Heron	<i>Ardeola ralloides</i>	9%	86%	Y		
Green-backed Heron	<i>Butorides striata</i>	7%		Y	Y	
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	4%		Y		
Little Bittern	<i>Ixobrychus minutus</i>	2%	43%	Y		
Hamerkop	<i>Scopus umbretta</i>	35%	43%	Y		
Glossy Ibis	<i>Plegadis falcinellus</i>	1%		Y		
Hadedda Ibis	<i>Bostrychia hagedash</i>	87%	100%	Y	Y	Y
African Sacred Ibis	<i>Threskiornis aethiopicus</i>	84%	100%	Y	Y	
African Spoonbill	<i>Platalea alba</i>	12%		Y		
Yellow-billed Stork	<i>Mycteria ibis</i>	1%		Y		
Black Stork	<i>Ciconia nigra</i>	1%		Y		
Woolly-necked Stork	<i>Ciconia episcopus</i>	1%	29%	Y		
White Stork	<i>Ciconia ciconia</i>	10%	57%	Y		
Black-headed Oriole	<i>Oriolus larvatus</i>	30%	14%			
Fork-tailed Drongo	<i>Dicrurus adsimilis</i>	76%	71%		Y	
African Paradise-Flycatcher	<i>Terpsiphone viridis</i>	13%	71%			
Brubru	<i>Nilais afer</i>	1%	14%			
Black-backed Puffback	<i>Dryoscopus cubla</i>	3%				
Black-crowned Tchagra	<i>Tchagra senegalus</i>	5%	57%			
Southern Tchagra	<i>Tchagra tchagra</i>	1%				
Southern Boubou	<i>Laniarius ferrugineus</i>	57%	57%		Y	
Bokmakierie	<i>Telophorus zeylonus</i>	1%				
Orange-breasted Bush-Shrike	<i>Telophorus sulfureopectus</i>	1%	14%			
Cape Batis	<i>Batis capensis</i>	4%				
Chinspot Batis	<i>Batis molitor</i>	2%				
Cape Crow	<i>Corvus capensis</i>	5%				
Pied Crow	<i>Corvus albus</i>	19%	100%			
White-necked Raven	<i>Corvus albicollis</i>	31%				
Red-backed Shrike	<i>Lanius collurio</i>	19%	29%			
Common Fiscal	<i>Lanius collaris</i>	74%	100%		Y	Y
Southern Black Tit	<i>Parus niger</i>	8%	14%			
Sand Martin	<i>Riparia riparia</i>	1%		Y		
Brown-throated Martin	<i>Riparia paludicola</i>	80%	100%	Y		
Banded Martin	<i>Riparia cincta</i>	4%				
Barn Swallow	<i>Hirundo rustica</i>	44%	100%			
White-throated Swallow	<i>Hirundo albigularis</i>	49%	71%	Y	Y	
Wire-tailed Swallow	<i>Hirundo smithii</i>	5%	14%	Y		
Greater Striped Swallow	<i>Hirundo cucullata</i>	17%				
Lesser Striped Swallow	<i>Hirundo abyssinica</i>	45%	100%			
Rock Martin	<i>Hirundo fuligula</i>	10%				
Common House-Martin	<i>Delichon urbicum</i>	1%	14%			
Black Saw-wing	<i>Psalidoprocne holomelaena</i>	45%	43%			
Dark-capped Bulbul	<i>Pycnonotus tricolor</i>	88%	100%			
Sombre Greenbul	<i>Andropadus importunus</i>	47%	100%			
Terrestrial Brownbul	<i>Phyllastrephus terrestris</i>	9%				
Cape Grassbird	<i>Sphenoeacus afer</i>	9%	57%			
Little Rush-Warbler	<i>Bradypterus baboecala</i>	82%	100%	Y	Y	
Barratt's Warbler	<i>Bradypterus barratti</i>	1%				



**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

Common name	Scientific name	Rep. rate		Waterbirds	Breeding	
		BIRP	This study		BIRP	This study
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	4%		Y		
African Reed-Warbler	<i>Acrocephalus baeticatus</i>	37%	100%	Y	Y	
Marsh Warbler	<i>Acrocephalus palustris</i>	5%	29%			
Great Reed-Warbler	<i>Acrocephalus arundinaceus</i>	7%		Y		
Lesser Swamp-Warbler	<i>Acrocephalus gracilirostris</i>	84%	100%	Y	Y	Y
Dark-capped Yellow Warbler	<i>Chloropeta natalensis</i>	59%	71%		Y	
Yellow-throated Woodland-Warbler	<i>Phylloscopus ruficapilla</i>	1%				
Willow Warbler	<i>Phylloscopus trochilus</i>	19%	57%			
Garden Warbler	<i>Sylvia borin</i>	1%				
Cape White-eye	<i>Zosterops virens</i>	2%	71%			
Red-faced Cisticola	<i>Cisticola erythrops</i>	16%	100%	Y		
Lazy Cisticola	<i>Cisticola aberrans</i>	2%				
Rattling Cisticola	<i>Cisticola chiniana</i>	4%				
Wailing Cisticola	<i>Cisticola lais</i>	1%			Y	
Levaillant's Cisticola	<i>Cisticola tinniens</i>	88%	100%	Y	Y	
Croaking Cisticola	<i>Cisticola natalensis</i>	8%	14%			
Neddicky	<i>Cisticola fulvicapilla</i>	14%	86%			
Zitting Cisticola	<i>Cisticola juncidis</i>	27%	86%		Y	
Pale-crowned Cisticola	<i>Cisticola cinnamomeus</i>	1%		Y		
Wing-snapping Cisticola	<i>Cisticola ayresii</i>	1%				
Tawny-flanked Prinia	<i>Prinia subflava</i>	87%	100%		Y	
Bar-throated Apalis	<i>Apalis thoracica</i>	14%	86%			
Green-backed Camaroptera	<i>Camaroptera brachyura</i>	4%	86%			
Rufous-naped Lark	<i>Mirafra africana</i>	2%				
Groundscraper Thrush	<i>Psophocichla litsipsirupa</i>	10%			Y	
Kurrichane Thrush	<i>Turdus libyanus</i>	16%	57%			
Olive Thrush	<i>Turdus olivaceus</i>		14%			
Southern Black Flycatcher	<i>Melaenornis pammelaina</i>	30%	14%		Y	
Fiscal Flycatcher	<i>Sigelus silens</i>	2%				
Spotted Flycatcher	<i>Muscicapa striata</i>	2%	14%			
African Dusky Flycatcher	<i>Muscicapa adusta</i>	8%	14%			
Cape Robin-Chat	<i>Cossypha caffra</i>	38%	57%		Y	
Red-capped Robin-Chat	<i>Cossypha natalensis</i>	5%				
White-browed Scrub-Robin	<i>Cercotrichas leucophrys</i>	4%				
African Stonechat	<i>Saxicola torquatus</i>	34%			Y	
Familiar Chat	<i>Cercomela familiaris</i>	1%				
Red-winged Starling	<i>Onychognathus morio</i>	5%				
Cape Glossy Starling	<i>Lamprotornis nitens</i>	7%				
Violet-backed Starling	<i>Cinnyricinclus leucogaster</i>	5%	14%			
Wattled Starling	<i>Creatophora cinerea</i>	2%				
Common Myna	<i>Acridotheres tristis</i>	50%	100%		Y	
Olive Sunbird	<i>Cyanomitra olivacea</i>	8%	14%			
Amethyst Sunbird	<i>Chalcomitra amethystina</i>	37%	57%			
Collared Sunbird	<i>Hedydipna collaris</i>	4%				
White-bellied Sunbird	<i>Cinnyris talatala</i>	15%				
Lesser Masked-Weaver	<i>Ploceus intermedius</i>	4%			Y	
Spectacled Weaver	<i>Ploceus ocularis</i>	65%	71%		Y	Y
Cape Weaver	<i>Ploceus capensis</i>	13%			Y	
Yellow Weaver	<i>Ploceus subaureus</i>	8%	71%		Y	Y
Golden Weaver	<i>Ploceus xanthops</i>	12%	14%		Y	Y
Southern Masked-Weaver	<i>Ploceus velatus</i>	1%			Y	
Village Weaver	<i>Ploceus cucullatus</i>	44%	100%		Y	Y
Red-headed Quelea	<i>Quelea erythrops</i>	9%	14%		Y	Y
Red-billed Quelea	<i>Quelea quelea</i>	15%	57%		Y	Y
Southern Red Bishop	<i>Euplectes orix</i>	78%	100%		Y	Y
Fan-tailed Widowbird	<i>Euplectes axillaris</i>	85%	100%		Y	
White-winged Widowbird	<i>Euplectes albonotatus</i>	41%			Y	
Red-collared Widowbird	<i>Euplectes ardens</i>	52%	71%		Y	
Long-tailed Widowbird	<i>Euplectes progne</i>	2%			Y	
Thick-billed Weaver	<i>Amblyospiza albifrons</i>	46%	100%		Y	Y

**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

Common name	Scientific name	Rep. rate		Waterbirds	Breeding	
		BIRP	This study		BIRP	This study
Orange-breasted Waxbill	<i>Amandava subflava</i>	18%				
African Quailfinch	<i>Ortygospiza atricollis</i>	1%				
Swee Waxbill	<i>Coccygia melanotis</i>	1%				
Common Waxbill	<i>Estrilda astrild</i>	73%	100%			Y
African Firefinch	<i>Lagonosticta rubricata</i>	22%				Y
Bronze Mannikin	<i>Spermestes cucullatus</i>	58%	29%			Y
Red-backed Mannikin	<i>Spermestes bicolor</i>	1%				
Pin-tailed Whydah	<i>Vidua macroura</i>	40%	71%			Y
Dusky Indigobird	<i>Vidua funerea</i>	1%				
House Sparrow	<i>Passer domesticus</i>	25%	14%			Y
Cape Sparrow	<i>Passer melanurus</i>	10%	43%			
Southern Grey-headed Sparrow	<i>Passer diffusus</i>	1%	57%			
Yellow-throated Petronia	<i>Petronia superciliaris</i>	2%				
African Pied Wagtail	<i>Motacilla aguimp</i>	36%	71%	Y		
Cape Wagtail	<i>Motacilla capensis</i>	84%	100%	Y		Y
Yellow Wagtail	<i>Motacilla flava</i>	1%		Y		
Mountain Wagtail	<i>Motacilla clara</i>	1%		Y		
Yellow-throated Longclaw	<i>Macronyx croceus</i>	40%	43%			
Cape Longclaw	<i>Macronyx capensis</i>	1%				
African Pipit	<i>Anthus cinnamomeus</i>	40%	71%			Y
Plain-backed Pipit	<i>Anthus leucophrys</i>	2%				
Cape Canary	<i>Serinus canicollis</i>	8%				
Yellow-fronted Canary	<i>Crithagra mozambicus</i>	85%	100%			Y
Brimstone Canary	<i>Crithagra sulphuratus</i>	47%	14%			
Streaky-headed Seedeater	<i>Crithagra gularis</i>	16%				
Golden-breasted Bunting	<i>Emberiza flaviventris</i>	1%				
<b>TOTALS</b>		<b>255</b>	<b>151</b>	<b>90</b>	<b>71</b>	<b>24</b>

**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

**Appendix 2.** Details of the waterbird counts made at Darvill as part of the CWAC Project. Only details from the six apparently complete counts are presented (see main text for further details).

Common name	Date						Avg	Max
	10-Mar-12	12-Aug-12	18-Jan-13	20-Aug-13	2-Feb-14	13-Feb-15		
Fulvous Duck	0	0	1	0	0	0	0.2	1
White-faced Duck	63	0	25	0	24	31	23.8	63
White-backed Duck	0	0	0	0	0	0		
Egyptian Goose	39	309	5	115	133	131	122.0	309
South African Shelduck	0	0	0	0	0	0		
Spur-winged Goose	0	39	2	6	4	0	8.5	39
Cape Teal	0	15	3	20	3	0	6.8	20
African Black Duck	2	0	3	0	0	1	1.0	3
Yellow-billed Duck	92	4	31	15	7	21	28.3	92
Cape Shoveler	0	4	1	2	0	0	1.2	4
Red-billed Teal	22	82	20	61	8	0	32.2	82
Hottentot Teal	45	30	24	21	0	0	20.0	45
Southern Pochard	0	3	1	0	0	0	0.7	3
Malachite Kingfisher	0	0	0	0	0	0		
Giant Kingfisher	0	0	0	0	0	0		
Pied Kingfisher	0	0	0	0	0	0		
Grey Crowned Crane	0	0	0	0	0	1	0.2	1
African Rail	0	0	0	0	0	0		
Black Crake	8	3	6	2	7	0	4.3	8
Baillon's Crake	0	0	0	0	0	0		
African Purple Swamphen	0	0	1	0	0	0	0.2	1
Common Moorhen	6	2	9	5	2	0	4.0	9
Red-knobbed Coot	1	10	8	2	2	3	4.3	10
African Snipe	2	0	0	5	0	0	1.2	5
Common Greenshank	0	0	0	0	1	0	0.2	1
Green Sandpiper	0	0	0	0	0	0		
Wood Sandpiper	13	1	49	1	46	0	18.3	49
Common Sandpiper	1	2	2	0	3	0	1.3	3
Little Stint	0	2	9	0	0	0	1.8	9
Ruff	41	23	41	0	1	0	17.7	41
African Jacana	0	1	2	4	0	0	1.2	4
Black-winged Stilt	0	48	10	64	0	0	20.3	64
Common Ringed Plover	0	0	2	0	0	0	0.3	2
Kittlitz's Plover	7	5	2	0	18	0	5.3	18
Three-banded Plover	6	0	0	2	8	0	2.7	8
Blacksmith Lapwing	60	14	67	50	90	0	46.8	90
African Fish-Eagle	1	1	0	1	1	0	0.7	1
African Marsh-Harrier	0	0	1	0	0	0	0.2	1
Little Grebe	8	41	13	11	15	0	14.7	41
African Darter	1	0	2	0	0	0	0.5	2
Reed Cormorant	0	0	0	0	0	0		
White-breasted Cormorant	0	0	0	0	1	0	0.2	1
Black Heron	0	0	0	0	0	0		
Little Egret	0	0	0	0	0	0		
Yellow-billed Egret	1	0	0	0	0	0	0.2	1
Great Egret	0	0	0	0	0	0		
Grey Heron	0	1	0	1	3	0	0.8	3
Black-headed Heron	7	4	3	0	22	0	6.0	22
Goliath Heron	0	2	1	1	0	0	0.7	2
Purple Heron	0	0	0	0	0	0		
Cattle Egret	47	100	1	57	44	0	41.5	100
Squacco Heron	0	1	0	1	0	0	0.3	1
Little Bittern	0	0	0	0	0	0		
Hamerkop	1	1	0	0	0	0	0.3	1
Hadeda Ibis	23	76	50	11	18	0	29.7	76
African Sacred Ibis	224	82	233	54	67	0	110.0	233
Woolly-necked Stork	0	0	0	0	0	0		



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Common name	Date						Avg	Max
	10-Mar-12	12-Aug-12	18-Jan-13	20-Aug-13	2-Feb-14	13-Feb-15		
White Stork	0	0	0	0	12	0	2.0	12
African Pied Wagtail	4	2	3	0	3	0	2.0	4
Cape Wagtail	8	9	5	4	8	3	6.2	9
Yellow Wagtail	0	0	0	0	2	0	0.3	2
<b>TOTAL SPP.</b>	<b>27</b>	<b>31</b>	<b>34</b>	<b>25</b>	<b>28</b>	<b>7</b>		
<b>TOTAL INDIVIDUALS</b>	<b>733</b>	<b>917</b>	<b>636</b>	<b>516</b>	<b>553</b>	<b>191</b>		

**Appendix 3.** Details of the waterbird count at Darvill made during this survey on 20 November 2015 covering only the four maturation ponds ('Ponds 1-4') and immediately surrounding area ('Other').

Common name	Ponds 1-4	Other	Total
Fulvous Duck			0
White-faced Duck	7	25	32
White-backed Duck			0
Egyptian Goose	90	2	92
South African Shelduck			0
Spur-winged Goose		2	2
Cape Teal			0
African Black Duck			0
Yellow-billed Duck		4	4
Cape Shoveler	5		5
Red-billed Teal	16	3	19
Hottentot Teal	8		8
Southern Pochard	1		1
Malachite Kingfisher			0
Giant Kingfisher			0
Pied Kingfisher			0
Grey Crowned Crane	2		2
African Rail			0
Black Crake	4		4
Baillon's Crake			0
African Purple Swamphen	2		2
Common Moorhen	10		10
Red-knobbed Coot	2		2
African Snipe	1		1
Common Greenshank			0
Green Sandpiper			0
Wood Sandpiper	6	1	7
Common Sandpiper	1	1	2
Little Stint			0
Ruff	2		2
African Jacana	5	1	6
Black-winged Stilt	3	1	4
Common Ringed Plover			0
Kittlitz's Plover			0
Three-banded Plover		2	2
Blacksmith Lapwing	21		21
African Fish-Eagle		3	3
African Marsh-Harrier			0
Little Grebe	81		81
African Darter			0
Reed Cormorant			0
White-breasted Cormorant			0
Black Heron			0
Little Egret			0
Yellow-billed Egret			0
Great Egret			0
Grey Heron			0
Black-headed Heron			0
Goliath Heron			0
Purple Heron			0
Cattle Egret		5	5
Squacco Heron			0
Little Bittern			0
Hamerkop			0
Hadedda Ibis	20	2	22
African Sacred Ibis	2	3	5
Woolly-necked Stork			0
White Stork			0

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<b>Common name</b>	<b>Ponds 1-4</b>	<b>Other</b>	<b>Total</b>
African Pied Wagtail		1	1
Cape Wagtail		5	5
Yellow Wagtail			0

**Appendix 4.** Details of the waterbird count at Darvill made during this survey on 21 November 2015 covering all the sections except the river ('P' = 'Pond').

Common name	Upper pastures	P1	P2	P3	P4	Lower canals	Lower dam	Other	Total
Fulvous Duck									0
White-faced Duck		15		3	8	37			63
White-backed Duck									0
Egyptian Goose	78	2		5		4			89
South African Shelduck									0
Spur-winged Goose		1		2		5			8
Cape Teal									0
African Black Duck									0
Yellow-billed Duck				4	6	2			12
Cape Shoveler									0
Red-billed Teal			1	3	16	5			25
Hottentot Teal			3		12				15
Southern Pochard									0
Malachite Kingfisher									0
Giant Kingfisher									0
Pied Kingfisher									0
Grey Crowned Crane									0
African Rail			2	2					4
Black Crake			4	4	7				15
Baillon's Crake									0
African Purple Swamphen									0
Common Moorhen		2	1	9	22				34
Red-knobbed Coot					20				20
African Snipe		3							3
Common Greenshank									0
Green Sandpiper									0
Wood Sandpiper		12		1	5	8	1		27
Common Sandpiper		1				3			4
Little Stint									0
Ruff		8			4	1			13
African Jacana		2			8	1			11
Black-winged Stilt						4			4
Common Ringed Plover									0
Kittlitz's Plover									0
Three-banded Plover		1		1		2	1		5
Blacksmith Lapwing	69	26		1		11	2		109
African Fish-Eagle									0
African Marsh-Harrier				1					1
Little Grebe				3	105	1			109
African Darter									0
Reed Cormorant				1					1
White-breasted Cormorant									0
Black Heron				1					1
Little Egret									0
Yellow-billed Egret									0
Great Egret									0
Grey Heron					2	5			7
Black-headed Heron						1			1
Goliath Heron					1	3			4
Purple Heron									0
Cattle Egret					1	4		50	55
Squacco Heron					1				1
Little Bittern			1						1
Hamerkop									0
Hadeda Ibis	9	3				5			17
African Sacred Ibis		7				6		15	28
Woolly-necked Stork			1						1



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<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>Other</b>	<b>Total</b>
White Stork									<b>0</b>
African Pied Wagtail						2			<b>2</b>
Cape Wagtail		3				2	1		<b>6</b>
Yellow Wagtail									<b>0</b>

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**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

**Appendix 5.** Details of the waterbird count at Darvill made during this survey on 29 November 2015 covering all the sections ('P' = 'Pond').

<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Fulvous Duck										0
White-faced Duck		12	1	9	7	13				42
White-backed Duck										0
Egyptian Goose	2	2		34		4		4		46
South African Shelduck					2					2
Spur-winged Goose				1	1	3		3	5	13
Cape Teal										0
African Black Duck								3		3
Yellow-billed Duck				3		1				4
Cape Shoveler					1					1
Red-billed Teal				4	8	5				17
Hottentot Teal		3	2	12	6					23
Southern Pochard					4					4
Malachite Kingfisher										0
Giant Kingfisher								1		1
Pied Kingfisher								1		1
Grey Crowned Crane			1							1
African Rail				2	1					3
Black Crake			4		2	1				7
Baillon's Crake										0
African Purple Swamphen				1						1
Common Moorhen		5	1	7	12	2				27
Red-knobbed Coot					8					8
African Snipe		1		1						2
Common Greenshank										0
Green Sandpiper										0
Wood Sandpiper		13		2	7	4				26
Common Sandpiper						1		2		3
Little Stint										0
Ruff		6			20					26
African Jacana		2			3	2				7
Black-winged Stilt										0
Common Ringed Plover										0
Kittlitz's Plover										0
Three-banded Plover		2				2				4
Blacksmith Lapwing	35	45			9	11	3			103
African Fish-Eagle								1		1
African Marsh-Harrier										0
Little Grebe				4	60	1				65
African Darter				1						1
Reed Cormorant										0
White-breasted Cormorant								2		2
Black Heron										0
Little Egret										0
Yellow-billed Egret										0
Great Egret										0
Grey Heron					1	4	13			18
Black-headed Heron		2				1				3
Goliath Heron		1	1		1			1		4
Purple Heron										0
Cattle Egret						40			21	61
Squacco Heron					2					2
Little Bittern					2					2
Hamerkop			1			1			3	5
Hadedda Ibis								2		2
African Sacred Ibis		10				5			4	19

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<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Woolly-necked Stork										<b>0</b>
White Stork										<b>0</b>
African Pied Wagtail						1				<b>1</b>
Cape Wagtail						8		1		<b>9</b>
Yellow Wagtail										<b>0</b>

**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

**Appendix 6.** Details of the waterbird count at Darvill made during this survey on 23 December 2015 covering all the sections ('P' = 'Pond').

<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Fulvous Duck										0
White-faced Duck		26	2	5		13				46
White-backed Duck										0
Egyptian Goose	81	2		3		7				93
South African Shelduck										0
Spur-winged Goose	4	1		6		1				12
Cape Teal										0
African Black Duck										0
Yellow-billed Duck		2		2		2				6
Cape Shoveler										0
Red-billed Teal						4				4
Hottentot Teal				4						4
Southern Pochard										0
Malachite Kingfisher										0
Giant Kingfisher										0
Pied Kingfisher										0
Grey Crowned Crane	1		1							2
African Rail					2					2
Black Crake		2	2	2						6
Baillon's Crake										0
African Purple Swamphen										0
Common Moorhen		7		10		2				19
Red-knobbed Coot										0
African Snipe		8								8
Common Greenshank										0
Green Sandpiper						1				1
Wood Sandpiper		26		1	1	3				31
Common Sandpiper										0
Little Stint										0
Ruff		4			10					14
African Jacana		11		4	5	1				21
Black-winged Stilt										0
Common Ringed Plover										0
Kittlitz's Plover										0
Three-banded Plover		2					1	1		4
Blacksmith Lapwing	120				110		15			245
African Fish-Eagle										0
African Marsh-Harrier		1			2					3
Little Grebe				10	30	2				42
African Darter										0
Reed Cormorant										0
White-breasted Cormorant										0
Black Heron										0
Little Egret										0
Yellow-billed Egret										0
Great Egret										0
Grey Heron							1			1
Black-headed Heron	7	2								9
Goliath Heron							1			1
Purple Heron										0
Cattle Egret				2			180			182
Squacco Heron					4					4
Little Bittern										0
Hamerkop										0
Hadedda Ibis	56					2		1	10	69
African Sacred Ibis	60	20				1	3		2	86



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SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT

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<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Woolly-necked Stork										<b>0</b>
White Stork	13									<b>13</b>
African Pied Wagtail										<b>0</b>
Cape Wagtail		1				2		2		<b>5</b>
Yellow Wagtail										<b>0</b>

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**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

**Appendix 7.** Details of the waterbird count at Darvill made during this survey on 10 January 2016 covering all the sections ('P' = 'Pond').

<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Fulvous Duck										0
White-faced Duck					5	35				40
White-backed Duck										0
Egyptian Goose	23	2		8		5	1	6		45
South African Shelduck					1					1
Spur-winged Goose	1			1		2		2	1	7
Cape Teal										0
African Black Duck										0
Yellow-billed Duck			2	4	2	14		2		24
Cape Shoveler						4				4
Red-billed Teal					1	13		2		16
Hottentot Teal			4	1	5					10
Southern Pochard										0
Malachite Kingfisher				1						1
Giant Kingfisher										0
Pied Kingfisher										0
Grey Crowned Crane			1							1
African Rail			2		2					4
Black Crake		7	2	4		1				14
Baillon's Crake										0
African Purple Swamphen				1	3					4
Common Moorhen		3	2	20	7	2				34
Red-knobbed Coot				2						2
African Snipe		8								8
Common Greenshank										0
Green Sandpiper						1				1
Wood Sandpiper		23		4	1	6	5			39
Common Sandpiper						2				2
Little Stint										0
Ruff										0
African Jacana		3		4	4	7				18
Black-winged Stilt						1				1
Common Ringed Plover										0
Kittlitz's Plover										0
Three-banded Plover						1	2	2		5
Blacksmith Lapwing	50	1		2			70			123
African Fish-Eagle										0
African Marsh-Harrier					1					1
Little Grebe		3		7	180					190
African Darter										0
Reed Cormorant								1		1
White-breasted Cormorant								1		1
Black Heron										0
Little Egret										0
Yellow-billed Egret					1					1
Great Egret				1						1
Grey Heron							3			3
Black-headed Heron	2				3	2			1	8
Goliath Heron					5					5
Purple Heron					1					1
Cattle Egret		4		4	60					68
Squacco Heron					6					6
Little Bittern										0
Hamerkop										0
Hadeda Ibis	84					3		2	3	92
African Sacred Ibis	22	20			60	3			1	106

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SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT

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<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Woolly-necked Stork										<b>0</b>
White Stork	80								30	<b>110</b>
African Pied Wagtail										<b>0</b>
Cape Wagtail						4				<b>4</b>
Yellow Wagtail										<b>0</b>

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**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

**Appendix 8.** Details of the waterbird count at Darvill made during this survey on 23 January 2016 covering all the sections ('P' = 'Pond').

<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Fulvous Duck						1				1
White-faced Duck	4	27	6	3	12	15	2			69
White-backed Duck										0
Egyptian Goose	11			14		6	2			33
South African Shelduck					2					2
Spur-winged Goose		4		3	3	1		3	3	17
Cape Teal										0
African Black Duck								1		1
Yellow-billed Duck				1	13	1				15
Cape Shoveler										0
Red-billed Teal		9	2	4	7	1				23
Hottentot Teal		13			6					19
Southern Pochard										0
Malachite Kingfisher				2		2				4
Giant Kingfisher										0
Pied Kingfisher										0
Grey Crowned Crane	6									6
African Rail			2		2					4
Black Crake		5	2	8						15
Baillon's Crake				1						1
African Purple Swamphen				5	4					9
Common Moorhen		7	1	23	19	2				52
Red-knobbed Coot				2						2
African Snipe										0
Common Greenshank										0
Green Sandpiper										0
Wood Sandpiper		20		2	4	3	8			37
Common Sandpiper						4				4
Little Stint										0
Ruff										0
African Jacana		5		9	14	16				44
Black-winged Stilt					2					2
Common Ringed Plover										0
Kittlitz's Plover						6				6
Three-banded Plover						5	8			13
Blacksmith Lapwing	20			4			150			174
African Fish-Eagle								1		1
African Marsh-Harrier										0
Little Grebe		4		7	215					226
African Darter										0
Reed Cormorant				1						1
White-breasted Cormorant										0
Black Heron										0
Little Egret										0
Yellow-billed Egret					2					2
Great Egret										0
Grey Heron										0
Black-headed Heron						2	1		1	4
Goliath Heron					4				1	5
Purple Heron										0
Cattle Egret					2	50				52
Squacco Heron					6	1				7
Little Bittern										0
Hamerkop						1				1
Hadeda Ibis	141						8		24	173
African Sacred Ibis	31	20			30		3		3	87

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SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT

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<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Woolly-necked Stork	1									<b>1</b>
White Stork	120								20	<b>140</b>
African Pied Wagtail						2				<b>2</b>
Cape Wagtail		1				5		2		<b>8</b>
Yellow Wagtail										<b>0</b>



**SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT**

**Appendix 9.** Details of the waterbird count at Darvill made during this survey on 7 February 2016 covering all the sections ('P' = 'Pond').

<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Fulvous Duck										0
White-faced Duck		2			6	20				28
White-backed Duck					2					2
Egyptian Goose	2	2		13		3			2	22
South African Shelduck					2					2
Spur-winged Goose		2		4					5	11
Cape Teal										0
African Black Duck								2		2
Yellow-billed Duck		2		2	21					25
Cape Shoveler										0
Red-billed Teal		1		2	14	4				21
Hottentot Teal		4	3	1						8
Southern Pochard										0
Malachite Kingfisher				2		1				3
Giant Kingfisher										0
Pied Kingfisher										0
Grey Crowned Crane										0
African Rail			2							2
Black Crake		7	2	4	2					15
Baillon's Crake										0
African Purple Swamphen				4						4
Common Moorhen		3		12	6					21
Red-knobbed Coot				5	2					7
African Snipe		1			2					3
Common Greenshank										0
Green Sandpiper										0
Wood Sandpiper		7		2	8	20				37
Common Sandpiper						6				6
Little Stint										0
Ruff										0
African Jacana		3		6	18	2				29
Black-winged Stilt						2				2
Common Ringed Plover										0
Kittlitz's Plover										0
Three-banded Plover						16				16
Blacksmith Lapwing	110				4		300			414
African Fish-Eagle										0
African Marsh-Harrier				1						1
Little Grebe				4	270					274
African Darter				1						1
Reed Cormorant					3					3
White-breasted Cormorant										0
Black Heron										0
Little Egret					1					1
Yellow-billed Egret					4					4
Great Egret										0
Grey Heron							2			2
Black-headed Heron										0
Goliath Heron					6					6
Purple Heron				1						1
Cattle Egret					1					1
Squacco Heron				1	3					4
Little Bittern				1		1				2
Hamerkop		1								1
Hadeda Ibis	36							4		40
African Sacred Ibis	15	8			32		5		1	61

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SPECIALIST AVIFAUNAL STUDY - DARVILL WTW CONSTRUCTED WETLAND PROJECT

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<b>Common name</b>	<b>Upper pastures</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>Lower canals</b>	<b>Lower dam</b>	<b>River</b>	<b>Other</b>	<b>Total</b>
Woolly-necked Stork										0
White Stork										0
African Pied Wagtail										0
Cape Wagtail	1					6				7
Yellow Wagtail										0

**Appendix 10.** Extract covering Darvill from: Bennett, G. & Herbert, S. 1995. Where to see birds in KwaZulu-Natal. *Mondi Southern Birds* 19: 1-81.

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*Southern Birds 19*

gate Shopping Centre and turn left into Murray Road (also marked M50). After 500 m, turn right along a dirt road and the reserve entrance soon appears on the left.

### Darvill Sewage Works

Less than 10 km from the centre of Pietermaritzburg lie the Darvill Sewage Works which are well known for the variety, and numbers of, waterbirds that can be seen there. At the northern end of the site there are four large ponds which, depending on the water levels, can attract large numbers of birds. There are pathways, providing good vantage points, leading around the ponds. These paths may sometimes appear to be overgrown but this is intentional, as it provides cover and nesting sites for waterfowl.

The lower ponds have more open water and are where the ducks and other waterfowl congregate. Flocks of Whitefaced and Yellowbilled Ducks, Hottentot and Redbilled Teal, Cape Shoveller and Southern Pochard are normally present. Other water birds you should see are Dabchick, Hamerkop, Moorhen, Redknobbed Coot, Threebanded Plover, Black-winged Stilt and, in summer, waders such as Wood and Marsh Sandpiper, Little Stint and Ruff. The reedbeds are home to species such as Little Bittern (rare), Black Crake, Baillon's

Crake (rare) and a host of warblers. Listen for, and possibly see, Cape Reed, African Sedge, European Sedge, African Marsh, Great Reed and Yellow Warblers. The "blackbacked" LBJs (Little Brown Jobs!) are Lev-aillant's Cisticola.

Above the ponds, it is often alive with swallows, martins and swifts including European, Greater Striped and Black Sawwing Swallows, and Rock and Brownthroated Martins. The swifts are represented by Black, Whiterumped, Little and Palm. The surrounding bush will add a number of extra species to your list including Olive and Kurrichane Thrushes, Cape Robin, Willow Warbler (summer), Southern Boubou, Bronze and Redbacked Mannikins and Bully Canary.

Travelling from Durban, take the New England Road offramp from the N3, turn right and cross the freeway. After 200 m, the road forks. Take the left hand fork and drive for about 2 km with the Maritzburg Golf Club on your right. The entrance to Darvill will appear on your left. Continue until you reach the second gate then take the track on the right which leads down to the ponds. No permit is required to gain entry to the complex.

**From:**  
**Bennett & Herbert (1995)**



**Appendix 11.** Extract covering Darvill from: Cohen, C., Spottiswoode, C. & Rossouw, J. 2006. Southern African birdfinder. Struik Publishers: Cape Town.

## SITES IN AND AROUND PIETERMARITZBURG

### 102 Darvill Resources Park

This wastewater treatment plant is perhaps Pietermaritzburg's most frequently visited birding venue, as it plays host to a wide variety of water-associated species, of which **Red-headed Quelea\*** is the most famous. Water-bird numbers on the larger upper ponds, a short walk from the car-park, vary according to water levels, with healthy numbers of Palearctic shorebirds present in summer, and waterfowl more numerous in winter. Good viewing may be had from the bird hides, although most species are as easily seen from the paths along the banks.

Extensive reedbeds surrounding the top two ponds are home to **Little Rush Warbler** and **Lesser Swamp-Warbler**, with **Sedge-Warbler**, and **African** and **Great Reed-Warblers** (uncommon) swelling their ranks in summer. The localised **Dark-capped Yellow Warbler**, another Darvill speciality, prefers taller, rank vegetation around the ponds. **African Rail** is heard frequently, but seen less commonly, feeding on exposed mud alongside **Black** and **Ballon's** (uncommon) **Crakes** and **African Snipe**.

Marshy edges of the lower, cement-lined strip ponds are the best areas to search for **Orange-breasted Waxbill** and the elusive **Red-headed Quelea\***, small flocks of which



Black Crake is a common reedbed railid.



Orange-breasted Waxbill

may be seen in summer. These edges are also excellent for migrant warblers, and **Green Sandpiper** has been recorded regularly in the vicinity. Scan dead trees here for **Brown-backed Honeybird**, **Red-throated Wryneck** and **Black Sparrowhawk**.

To reach Darvill, take the Scottsville/New England Road turn-off from the N3, and head east on New England Road. Bear left at the service station; drive past Pietermaritzburg Golf Club, and continue for 2 km to the park entrance gate. Proceed to the parking area, where an entrance fee is payable.

From: Cohen *et al.* (2006)



**Appendix 12.** Extract covering Darvill from: Hardaker, T. 2007. Birding hotspots. Africa - Birds & Birding: Cape Town.

# darvill resources park

**OVERVIEW** Formally known as the Darvill Sewage Works, this is probably one of the most popular birding destinations in the Pietermaritzburg area. It has a birdlist of more than 280 species. The main habitats for birding are the large settling ponds (where the water levels vary and there are often some mudflats present) and the lower strip-ponds. There are also pockets of indigenous trees and shrubs.

**KEY SPECIES** Baillon's Crake, Red-headed Quelea, Little Bittern, Grey Crowned Crane, Dark-capped Yellow Warbler.

**VISITOR INFO** There are several hides from which you can watch the birds, but there are also paths between all the ponds which allow for easy viewing. A small entrance fee is payable. The park is open all day. For further information, tel. (033) 396 8000.

The settling ponds hold good numbers of waterfowl and herons, while the reedbeds teem with Lesser Swamp-Warblers and Little Rush-Warblers (joined in summer by African and Great reed-warblers and Sedge Warblers). Searching the taller rank vegetation around the ponds could also produce Dark-capped Yellow Warbler. In summer, large flocks of Palearctic waders visit the mudflats, which can also host Grey Crowned Cranes. Patient watching of the edges of the reedbeds might yield sightings of Black and Baillon's crakes or African Rail.

The lower strip-ponds are probably the best place to look for Squacco Heron, Little Bittern and sometimes even Lesser Moorhen. The ponds attract Green Sandpipers in most years, and this is



ALBERT FROEMAN

### WHERE?

To get there, take the 'Scottsville/ New England' turnoff from the N3 and head east along New England Road. Bear left at the service station and continue along this road until you reach the entrance gate, about two kilometres beyond the golf club.



JAMES WAKELIN

also where the best known of the Darvill inhabitants, Red-headed Quelea, occurs.

Turning your attention to the indigenous trees and shrubs, you may find Brown-backed Honeybird, Red-throated Wryneck and Golden-tailed Woodpecker. Raptors are well represented, with African Fish-Eagle, African Harrier-Hawk, Black Sparrowhawk and even Osprey in evidence.

**WADING IN** (Left) The settling ponds are a magnet for herons and bitterns. (Above) Golden-tailed Woodpecker.

From: Hardaker (2007)

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