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THE BIRDS OF BLUE HILL NATURE RESERVE: THE FYNBOS ENDEMIC BIRD SURVEY

Alan TK Lee & Phoebe Barnard

Climate Change & BioAdaptation Division, South African National Biodiversity Institute, Private Bag X7, Claremont 7735, South Africa

alan.tk.lee@googlemail.com, p.barnard@sanbi.org.za

Summary

The Fynbos Biome has six endemic passerine species. There are very few ringing records in the SAFRING database for Protea Seedeater, Victorin's Warbler and Cape Rockjumper. While Cape Sugarbird and Orange-breasted Sunbird are well represented, references to their movements tend to focus on extreme events, while movements in relation to life-history strategies remain a matter of discussion. We present basic data on captures from an aseasonal rainfall Mountain Fynbos area at the Blue Hill Nature Reserve, part of the Baviaanskloof Mega-reserve, located in the eastern Western Cape Province of South Africa. Ringing efforts have so far targeted nectarivores, as these occur in large numbers in association with mature stands of ornithophilous Protea species. We note the influence of a fire on capture rates; areas with mature Protea-dominated Fynbos resulted in expectedly high capture rates of Cape Sugarbird and Orange-breasted Sunbird, while ringing in the same locations post-fire resulted in almost no captures of these species, although nectarivore capture rates were the same in unburnt areas pre- and post-fire. The ringing efforts have in addition produced the largest dataset for one location for Protea Seedeaters. Future efforts will continue to focus on nectarivore movements, targeting the endemic granivores and insectivores opportunistically; with intensive ringing at Blue Hill Nature Reserve and sites within a 100 km radius.

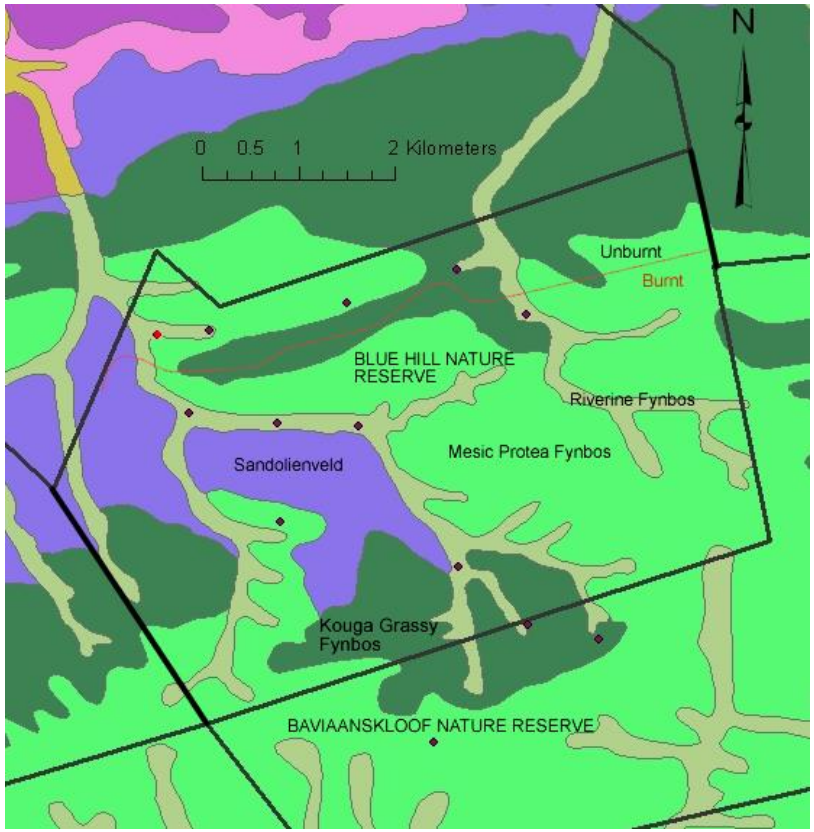

Figure 1: Map of the Blue Hill Nature Reserve showing ringing locations (dots) and vegetation types according to Vlok et al. 2005. The red dot shows the location of the anthropogenic habitat. The thin red line is the approximate northern limit of the January 2012 fire, i.e. most of the vegetation to the south of this line was burnt. The ignition point was to the south of the boundary of this map.

Introduction

Mountain Fynbos (characterized by vegetation dominated by Protea, Erica and/or Restio families) has six endemic passerine bird species in a habitat usually described as species-poor. Mature Mountain Fynbos is dominated by the endemic nectarivores Cape Sugarbird

Promerops cafer (Fig. 2) and Orange-breasted Sunbird *Nectarinia violacea*, for which the SAFRING database as of Dec 2011 had >8000 and >3000 records respectively. Like many other species in the database, most of these birds were handled from the 1980s onwards. The two insectivores were poorly represented in the database; Cape Rockjumper *Chaetops frenatus* with 40 records and Victorin's Warbler *Bradypterus victorini* with 27. Of the two granivores, Cape Siskin *Serinus totta* was better represented with 320 records, while Protea Seedeater *Crithagra leucoptera* had 29.

Due to the relative ease with which nectarivores can be captured when they congregate on concentrated patches of preferred food resources, movements of Cape Sugarbird and Orange-breasted Sunbird are the best known of the Fynbos endemic species. Cape Sugarbird has been the focus of over 20 peer-reviewed publications, many based on ringing projects or marked birds, and is hence the best known of the Fynbos endemic species. Cape Sugarbirds are reliant on nectar-producing Proteaceae for food and nesting resources (Broekhuysen 1959). Most Protea species have a seasonal peak in flowering season during the year, and so when not breeding, many sugarbirds appear to be nomadic, moving between patches of nectar-producing plant species (Altwegg and Underhill 2006). The movements of closely related Gurney's Sugarbirds of the eastern Highveld region of South Africa are linked to flowering patterns of *Protea roupelliae* (De Swardt 1991). However, the extent, scale and regularity of any annual movement patterns in the Fynbos region are poorly understood despite the identification of itinerant and transient populations in some locations.

The Orange-breasted Sunbird has also featured in many pollination biology related studies. From ringing records, they have been reported to make smaller scale altitudinal movements compared to Cape Sugarbirds (<10km, SAFRING unpublished data). They feed on a wider variety of nectar producing plants including protea, but especially erica species (Broekhuysen 1963).

Movements of the other endemic species are very poorly quantified from ringing records. Many canary species from the Western and Northern Cape provinces are considered to be nomadic to some degree undertaking large-scale movements in search of food resources in response to rainfall events (Dean et al. 2009).

Our project has two main study areas, the first in the greater Cape Town area, and the second at Blue Hill Nature Reserve (BHNR). Here we report on fairly intensive ringing at BHNR, the first step in an effort that we hope at least provide insights into local nectarivores' movements in aseasonal mountain Fynbos.

Figure 2. Cape Sugarbird on *Protea mundii*, Prince Alfred's Pass

Methods

Study Site

From June 2011 until October 2012 ringing was conducted at Blue Hill Nature Reserve (BHNR; -33.56 to -33.62; 23.40 to 23.43E; Figure 1) on the western border of the Baviaanskloof Nature Reserve, Western Cape, South Africa. The Baviaanskloof Nature Reserve encompasses a range of biomes including Savanna, Afromontane forest, Thicket, Fynbos, Nama and Succulent Karoo. The 2230 hectare BHNR lies between 1000 and 1530 meters above sea level (m asl). The reserve falls into an aseasonal rainfall region, with annual informal records from the closest town, Uniondale (40km distant, 730 m asl), for the 1965 – 1997 period 344 ± 102mm.

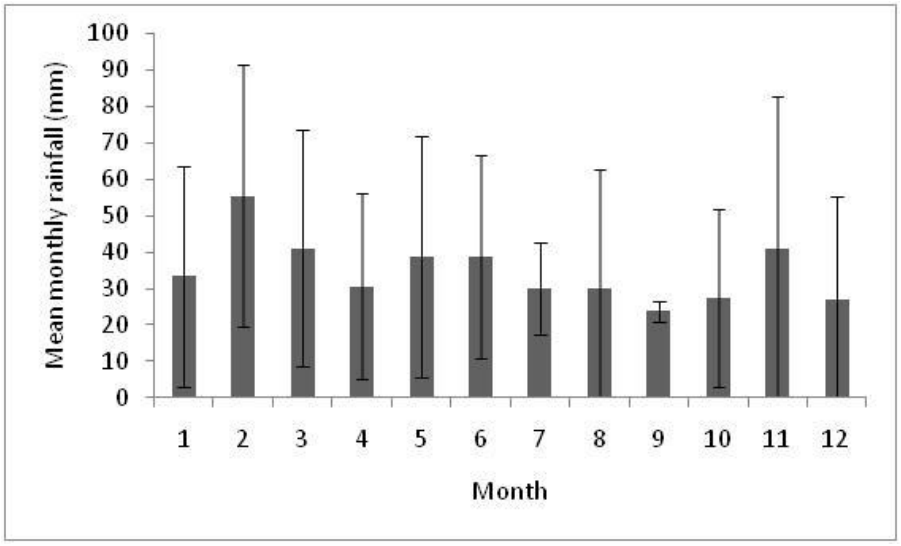

Figure 3: Monthly rainfall patterns (mean, bars represent standard deviation) for the period 2005 – 2011 from Paardekraal farm adjacent to Blue Hill Nature Reserve.

Mean monthly rainfall patterns for the period 2005 – 2011 from a farm adjacent to BHNR are presented in Figure 3. Fynbos age for most of the reserve was estimated to be over 14 years as of 2011, with a small section (not ringed) aged four years. In January 2012, electric storms across the Kouga Mountains ignited multiple fires which burnt over a wide area (>10 000ha), including c. 1 800ha (80%) of BHNR. South-facing slopes were dominated by mature, mesic proteoid Fynbos, including contiguous stands of >2m *Protea repens, P. neriifolia, P. eximia, P. punctata, P. lorifolia*, and various Erica species. While the Erica community was dominated by insect pollinated species e.g. *Erica passerinae, E. melanthera, E. caffra* and *E. floccifloria* (Endangered), loose stands of the bird pollinated *E. curviflora, E. wendlandiana* and *E. pectinifolia* occurred patchily at low densities. North and east facing slopes were classified as Sandolienveld (Vlok et al 2005), characterised by *Dodonea viscosa*, *Phylica curvifolia, Aloe perfoliata* and *Aspalathus* species. Tsitsikamma perennial stream vegetation (Fynbos riverine thicket), dominated by *Cliffortia* and *Psoralea* species, occur along three small streams, one perennial and two annual. Secondary Renosterveld occurs on soils derived from shale bands and conglomerates in areas cleared >15 years previously for agricultural purposes. These are dominated by *Elytropappus rhinocerotis* and *Muraltia spinosa*.

Bird capture and ringing

No ringing was conducted on the nature reserve prior to 2011, and little has been done in the Uniondale – Baviaanskloof region. Some ringing was conducted from January 2011 during AL training sessions (see acknowledgements for ringers involved). All ringing sites were georeferenced and most were visited on more than two occasions. Prior to the fire, up to 5 x 12m length (up to 60m total length) standard nets were used for capturing birds and we followed guidelines following SAFRING (de Beer et al. 2001). This length was generally sufficient to allow AL to extract and handle birds alone, with occasional assistance from non-ringer volunteers. Due to low capture rates post-fire, length of net used was generally extended to 108m in areas that had experienced fire, and greater use was made of 'spring-traps' baited with meal-worms. Ringing generally took place just from sunrise, as there is often an ideal mist-netting weather window in the few hours following dawn at BHNR, when there is generally little to no wind. From mid-morning onwards, medium to strong on-shore and anabatic winds occur.

Results

Ringing and recaptures

A total of 113 days was spent ringing for this reporting period by AL, resulting in 1717 captures of 1574 individuals (143 recaptures, 8% recapture rate) of 57 species (Table 1). Cape Sugarbirds formed the bulk of captures, with 455, followed by Orange-breasted Sunbirds

(326) and Cape Weavers *Ploceus capensis* (113). The BHNR bird list stands at over 140 species, and several functional groups are not represented in the list of species captured, including nocturnal birds, large-bodied non-passerines (e.g. spurfowl) and raptors, while aerial insectivores (e.g. swifts) are underrepresented. In addition, several vocally prominent species including Cape Rockjumper and Ground Woodpecker *Geocolaptes olivaceus* were not captured despite efforts to do so. No birds ringed outside the study area were captured during this period.

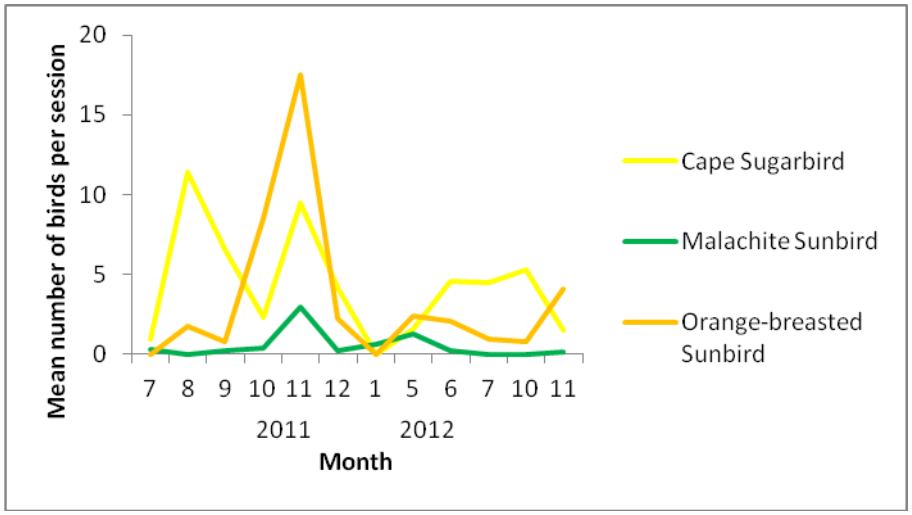

Figure 4: Capture rates (mean number of target birds per ringing session by month) for the three dominant nectarivores at BHNR, showing a reduction in capture rates post-fire (January 2012).

Of the endemic nectarivore recaptures (CSB n = 15, OBS n = 7 individuals), none was recovered from a distance greater than 1km from site of initial capture. Ringing efforts in December 2012 at 10 sites within 100km of BHNR, including the Prince Alfred's Pass and Kammanassie Nature Reserve has resulted in the capture of nearly 300 Cape Sugarbirds, but there have been no recaptures of these are any other species between sites. Levels of nectarivore capture were reduced after the fire, and those that were captured post fire were in unburnt sections of the reserve (Figure 4). Only one Orange-breasted Sunbird was captured in the burnt section of the reserve after the fire event.

Most granivorous species and individuals were captured at one site where drinking and bathing behaviour were observed, and this accounted for five recaptures of Cape Siskin. There were no recaptures of Protea Seedeater during this reporting period, although one individual was recaptured subsequently during the preparation of this report. Post-fire, partly due to good rains that kept annual streams flowing, and partly due to the reduction in vegetation cover over water bodies due to the fire, this drinking site was not as productive compared to the pre-fire period presumably due to the presence of alternative drinking locations made available by the removal of overhanging vegetation. This explanation may extend to the aerial insectivores, most of which were captured at the pre-fire drinking site.

Discussion

BHNR and the greater Baviaanskloof have provided eventful and exciting ringing opportunities in terms of bird species captured, partly due to the mature stands of protea species which attracted large numbers of target nectarivores, and due to the juxtaposition of very different dry and wet habitats. Since no ringing has taken place on BHNR or greater Uniondale area, efforts have targeted nectarivores and birds visiting drinking sites in an effort to maximise the number of rings on birds. These results will provide an interesting comparison with the many ringing records in the SAFRING database which are the results of efforts based in winter rainfall Fynbos of the Cape Peninsula and nearby Boland mountain ranges.

Blue Hill Nature Reserve provided an ideal site to investigate small scale movements (<10km) between mature patches of a variety of species of Protea. However, the fire through the reserve only three months after project initiation has resulted in a slight disruption of the initial protocol, but provided interesting results in

terms of dietary guild composition pre- and post-fire (Lee & Barnard in prep.). For nectarivores, this raises the questions: Do birds then survive in isolated pockets of intact Fynbos or do they recolonise recovering Fynbos from surrounding mountain ranges? In addition, what is the minimum patch size and required to support a viable population? How does distance from extensive unburnt areas influence pollinator dynamics for isolated patches? At least it appears from our broad exploratory analysis that the dominant bird pollinated protea species flower so that at least one species is in bloom at any one time of the year, facilitating the persistence of their pollinators at least in the eastern areas of Mountain Fynbos. Protea communities on the mountain ranges in this area have yet to be formerly quantified, but at least it would appear that barring major large scale fires, that movement out of the area in search of food resources is not necessary. While there is a peak in food availaibility in terms of flowering *Protea neriifolia* and *Protea repens* over the autumn and winter period, *Protea eximia* flowers in early summer, and *Protea nitida* flowers all year round at low densities.

Upland Mountain Fynbos, which is typically dominated by an overstorey of Proteaceae given a sufficient period of time between fire return intervals, is typically found on many of the Cape fold mountain ranges, e.g. Langeberg, Cederberg, Swartberg. Many of these ranges are separated from each other by modified landscapes or habitats devoid of Proteaceae. Most of these mountain chains are also home to 5 – 10 species of nectar producing Proteaceae. However, bottle-necks in nectar production have not been investigated due to a lack of detailed phenological data. Should bottlenecks exist, this would imply that Cape Sugarbirds would need to move between the mountain chains. We cannot yet be confident about the scale of movements undertaken on the individual or population level as it appears at the moment that although capture rates appear high at targeted sites, that there is a large population of sugarbirds and so recapture rate thus far is not especially high. Cape Sugarbird density is reported to be between 0.5 - 4 birds per hectare (Fraser 1989), which making the BHNR reserve population somewhere between 1150 – 9200 means we have ringed between 40 – 5% of the local population. However, many birds caught were juveniles and we suspect that juvenile survival rate is lower than adult survival (estimated at 0.54 by Altwegg and Underhill 2006). Combined with a mobile population of either itinerant populations on yet unidentified routes or transient populations on more random trajectories, this makes recovering ringed birds a challenging undertaking. From the beginning of 2013 we have deployed heat-triggered remote camera traps in Protea stands in order to increase 'resightings' of uniquely color ringed male Cape Sugarbirds. The interesting juxtaposition of habitats in the Baviaanskloof Megareserve and how the plant communities in them are used by the suite of Fynbos endemic bird species has yet to be determined, and offer many opportunities for ringing efforts in the area to provide answers in the future.

With only a few captures of the endemic insectivores, it is clear that a very large and targeted efforts will need to be made in order ring sufficient individuals of either Victorin's Warbler or Cape Rockjumper and this information will probably only be accrued over a much greater time period and will require intensive, targeted efforts.

Acknowledgements

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Figure 5. Ringed Protea Seedeater

Table 1: Bird species captured at BHNR together with breakdown by code. RR = Recapture Rate. Species are listed from most commonly to least commonly captured according to total captures.

Name		New	Recaptures	RR	Recovered	Total
Cape Sugarbird	*Promerops cafer*	440	15	3%		455
Orange-breasted Sunbird	*Nectarinia violacea*	319	7	2%		326
Cape Weaver	*Ploceus capensis*	71	40	35%	2	113
Cape Robin-Chat	*Cossypha caffra*	56	20	26%		76
Southern Double-collared Sunbird	*Nectarinia chalybea*	66	4	6%		70
Cape White-eye	*Zosterops virens*	59	9	13%		68
Yellow Canary	*Serinus flaviventris*	67		0%		67
Cape Siskin	*Crithagra totta*	52	5	9%		57
Protea Seedeater	*Serinus leucopterus*	53		0%		53
Malachite Sunbird	*Nectarinia famosa*	40	2	5%		42
Yellow Bishop	*Euplectes capensis*	37	4	10%		41
Cape Bulbul	*Pycnonotus capensis*	23	6	21%		29
Karoo Prinia	*Prinia maculosa*	24	5	17%		29
Cape Bunting	*Emberiza capensis*	22		0%		22
Speckled Mousebird	*Colius striatus*	20	2	9%		22
Common Fiscal	*Lanius collaris*	14	4	21%	1	19
Karoo Scrub-Robin	*Cercotrichas coryphaeus*	15	1	6%		16
Red-winged Starling	*Onychognathus morio*	10	6	38%		16
Bar-throated Apalis	*Apalis thoracica*	11	3	21%		14
Brimstone Canary	*Serinus sulphuratus*	14		0%		14
Long-billed Crombec	*Sylvietta rufescens*	10		0%		10
House Sparrow	*Passer domesticus*	7	2	22%		9
Southern Boubou	*Laniarius ferrugineus*	6	3	33%		9
Southern Masked-Weaver	*Ploceus velatus*	4	5	56%		9
Bokmakierie	*Telophorus zeylonus*	7	1	13%		8
Familiar Chat	*Cercomela familiaris*	8		0%		8
Streaky-headed Seedeater	*Serinus gularis*	7	1	13%		8
Greater Striped-Swallow	*Hirundo cucullata*	7		0%		7
Grey-backed Cisticola	*Cisticola subruficapillus*	7		0%		7

Neddicky	*Cisticola fulvicapillus*	6	1	14%	7
Amethyst Sunbird	*Nectarinia amethystine*	3	3	50%	6
Black-headed Canary	*Serinus alario*	6		0%	6
Cape Grassbird	*Sphenoeacus afer*	5	1	17%	6
Common Waxbill	*Estrilda astrild*	6		0%	6
Olive Thrush	*Turdus olivaceus*	2	4	67%	6
Rock Martin	*Hirundo fuligula*	5	1	17%	6
Victorin's Warbler	*Bradypterus victorini*	5	1	17%	6
Cape Rock-Thrush	*Monticola rupestris*	5		0%	5
Cape Turtle Dove	*Streptopelia capicola*	5		0%	5
Cape Canary	*Serinus canicollis*	4		0%	4
Southern Tchagra	*Tchagra tchagra*	4		0%	4
Cape Wagtail	*Motacilla capensis*	3		0%	3
Cardinal Woodpecker	*Dendropicos fuscescens*	2	1	33%	3
Southern Greyheaded Sparrow	*Passer diffuses*	2	1	33%	3
Cape Batis	*Batis capensis*	2		0%	2
Fork-tailed Drongo	*Dicrurus adsimilis*	2		0%	2
Greater Double-collared Sunbird	*Nectarinia afra*	2		0%	2
Red-faced Mousebird	*Urocolius indicus*	2		0%	2
African Stonechat	*Saxicola torquata*	1		0%	1
Barn Swallow	*Hirundo rustica*	1		0%	1
Cape Penduline-Tit	*Anthoscopus minutes*	1		0%	1
Fiscal Flycatcher	*Sigelus silens*	1		0%	1
Layard's Tit-Babbler	*Parisoma layardi*	1		0%	1
Marsh Warbler	*Acrocephalus palustris*	1		0%	1
Namaqua Dove	*Phragmacia substriata*	1		0%	1
Pin-tailed Whydah	*Vidua macroura*	1		0%	1
Speckled Pigeon	*Columba guinea*	1		0%	1