Ornithological Observations

An electronic journal published by BirdLife South Africa and the Animal Demography Unit at the University of Cape Town

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Editor: Arnold van der Westhuizen

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Recommended citation format:
De Swardt DH 2012. Bird species captured in *Protea roupelliae* woodland and their association with *Protea* habitats. Ornithological Observations, Vol 3: 29-37

URL: http://oo.adu.org.za/content.php?id=37

Published online: 06 July 2012

- ISSN 2219-0341 -

BIRD SPECIES CAPTURED IN *PROTEA ROUPELLIAE* WOODLAND AND THEIR ASSOCIATION WITH *PROTEA* HABITATS

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During a long term study on the seasonal movements of Gurney's Sugarbirds *Promerops gurneyi* in the Lydenburg area, Mpumalanga, sugarbirds as well as other species were captured and ringed in *Protea roupelliae* woodland (De Swardt 1991). Aspects of the avifauna associated with *Protea* woodland and the factors which affect sugarbird densities were also studied (De Swardt 1993). De Swardt (1993) listed 29 species (of 812 individuals) captured in *P. roupelliae* woodland between December 1986 and December 1992. The most frequently captured species were Gurney's Sugarbirds, three sunbird species, Cape White-eyes *Zosterops spp.* and two canary species.

This paper reports on continued research on Gurney's Sugarbirds and Malachite Sunbirds *Nectarinia famosa* in both the areas of Lydenburg, Mpumalanga and the eastern Free State between March 1993 and February 2011. Capturing sessions focussed on isolated clumps of *P. roupelliae* woodland in mountainous grassland habitats. The Lydenburg study localities have been described by De Swardt (1990, 1998) and includes the following farms around the Long Tom Pass: Paardeplaats, Sterkspruit, Natalshoop, Nooitgedacht and Gustav Klingbiel Nature Reserve as well as the farms Oshoek and Goedehoop on the Steenkampsberg Pass. In the Free State birds were captured in the high lying areas of Sterkfontein Dam Nature Reserve and in QwaQwa National Park (now part of Golden Gate Highlands National Park and refered further in this paper as QQNP). The *Protea* localities in QQNP were on the top of QwaQwa Mountain, as well as at Avondrus, Honingkloof and at Wonderhoek (in Golden Gate Highlands National Park) in mixed *P. caffra/ P. roupelliae* woodland (de Swardt & van Niekerk 1996).

Results and discussion

During the study between March 1993 and February 2011 a total of 1 005 birds were captured at the *P. roupelliae* study localities, bringing the total birds captured to 1 817 individuals since 1986 (Table 1). Gurney's Sugarbird (36.3%) and Malachite Sunbird (34.3%) were the most frequently captured species while Greater Double-collared Sunbird *Cinnyris afra* and Amethyst Sunbird *Chalcomitra amethystina*, Cape White-eyes *Zosterops virens*, Dark-capped Bulbul *Pycnonotus tricolor*, Streaky-headed Seedeater *Crithagra gularis* and Cape Canary *Serinus canicollis* were also captured in high numbers (see Table 1). The 4 nectarivore species represents 80.5% of the total birds captured.

Malachite Sunbirds were the most abundant sunbird species captured in the *Protea* woodland and sometimes occur in even higher numbers than sugarbirds (Figure 1). In November 2007 a total of 65 sunbird individuals were captured at the Natalshoop study site while only six sugarbirds were captured at the same locality. In the same period at some of the other sites, such as Paardeplaats, fewer

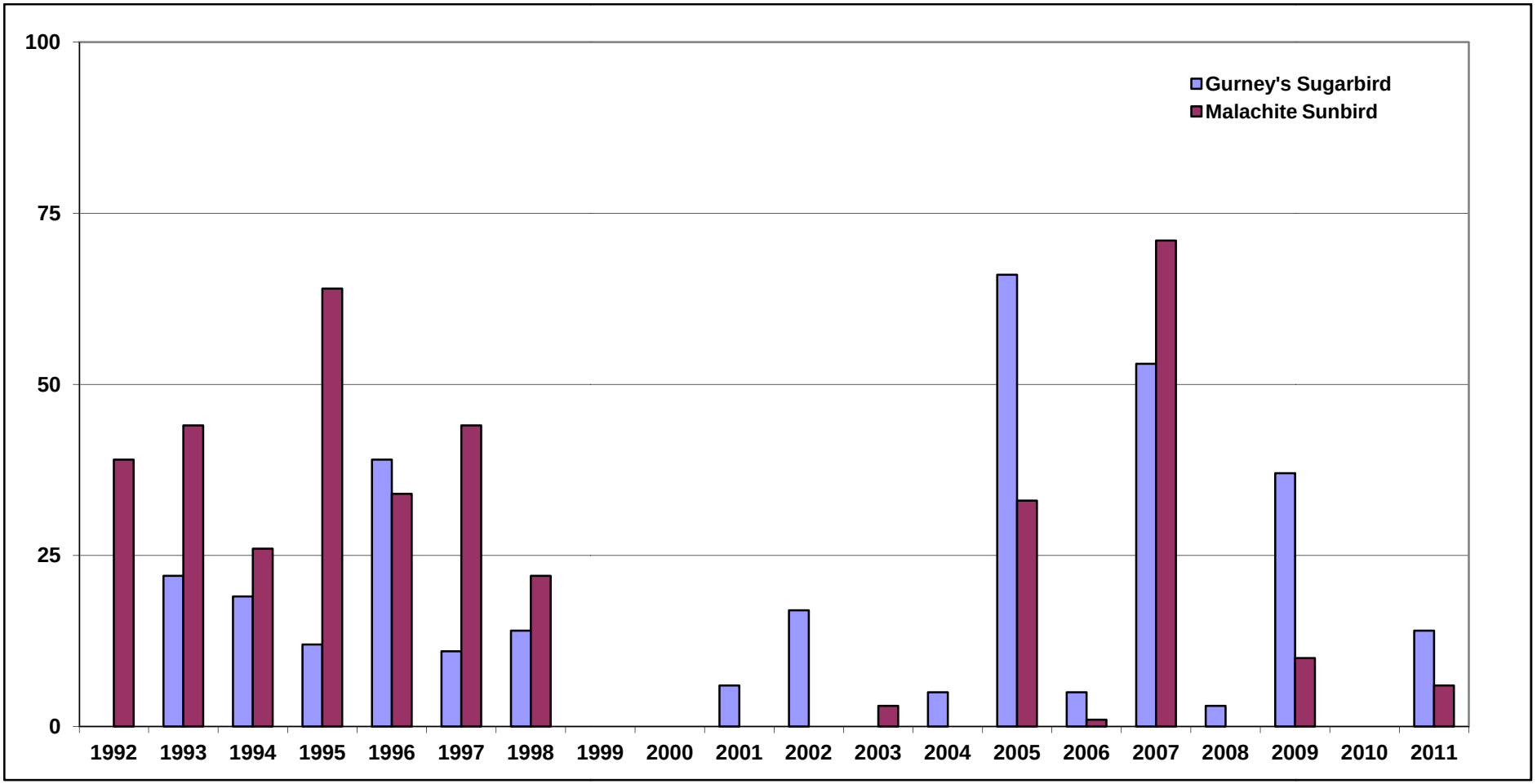

Figure 1 – Comparison of Gurney's Sugarbirds vs Malachite Sunbirds

Protea infloresences were available. At these sites as the *Protea*s have not yet reached its flowering peak and flowers were not as abundant as at the Nooitgedacht site. During the winter months (May–August) Malachite Sunbirds are absent from *Protea* localities in the mountains and adjacent escarpment range in the Lydenburg area. It still cannot be established with certainty where these birds move to during the winter months as no seasonal movement data in the Lydenburg and surrounding areas were collected yet (pers. obs). Very few were observed or even captured in the Lydenburg suburban areas during winter – only 7 Malachite Sunbirds were captured during June 1989 (Safring data).

Amethyst and Greater Double-collared Sunbirds are known to move seasonally between the mountain and town localities (De Swardt and Schoeman 1997). Both species could be observed all year round in the suburban areas with winter influxes from the surrounding mountainous areas. Greater Double-collared Sunbirds and to a lesser extend Amethyst Sunbirds are abundant at the *Protea* localities as well (Figure 2). During winter small numbers of Greater Double-collared Sunbirds were present at mountain localities feeding on available *P. roupelliae* flowers and also *Halleria lucida* infloresences growing on the forest edges and on road verges along the Long Tom Pass. A total of 16 Greater Double-collared Sunbirds were captured in the June–July period at the mountain localities. This species had been recaptured in the suburban areas in the same time frame. One example of seasonal movement was bird number X02667 which was ringed in Gustav Klingbiel Nature Reserve and recaptured four months later in the suburban area. No Amethyst Sunbirds were captured during winter at the mountain localities although seasonal movements have been observed between these two localities. A sunbird (ring no AB99479) captured in June 1992 in the suburban area was recaptured at Paardeplaats along the Long Tom Pass in January 1996.

Non-nectarivore species such as Cape White-eye, Streaky-headed Seedeater, Cape Canary, Dark-capped Bulbul, Wailing Cisticola *Cisticola lais*, Longbilled Pipit *Anthus similis* were frequently captured in *Protea* woodland. Other grassland and montane species (see Table 1) were captured as well during ringing sessions in the localities listed. Most of these species were observed feeding on *Protea* nectar (White-eyes), feeding on *Protea* seeds (Canaries and Buntings), nesting in *Protea* trees or using the grassland or woodland habitat niche around the *Protea* clumps. Some birds were temporarily resident or are just passing through the *Protea* grassland habitat. An example of the last observation is the two Olive Woodpeckers *Dendropicos griseocephalus* captured in the *Protea* woodland. This species are mostly resident in the surrounding forest patches. Other species listed in Table 1 and captured during the study, such as Yellow Bishop *Euplectes capensis* are associated with moist grassland where small streams form marshy grassland. These non-nectarivores mostly utilize other micro habitats in the *Protea* woodland such as grassland, rocky hills and mountain slopes where the *Protea* trees occur mostly in isolated clumps or open woodland (De Swardt 1993).

Nectarivore densities for Gurney's Sugarbird and Malachite Sunbird were determined at 11 selected *P. roupelliae* clumps in the study sites. Densities of 4.6 birds ha^{-1} for Sugarbirds and 3.5 birds ha^{-1} for

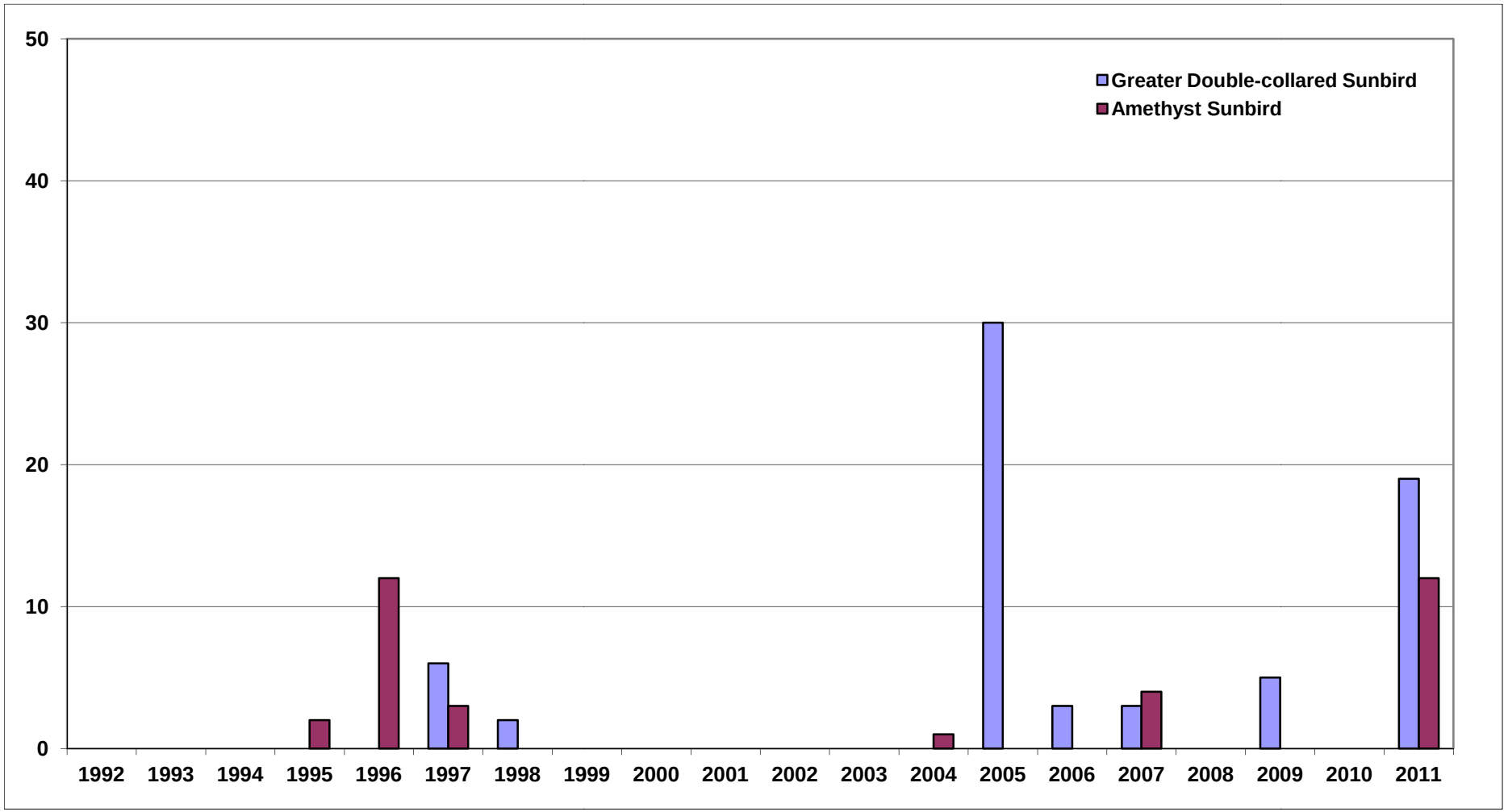

Figure 2 – The occurance of Greater Double-collared Sunbirds and Amethyst Sunbirds in *Protea* localities.

Malachite Sunbirds were established (De Swardt 1993). Bird densities were found not only to be related to the relative size of the *Protea* clumps, but also to the availability of *Protea* inflorescences which varied through the seasons – larger clumps supported more nectarivores, but higher densities could also occur at smaller *Protea* clumps where abundant inflorences were available. The higher density of birds in smaller clumps of *Protea* with abundant flowers is better explained by the influence of rainfall on the seasonal occurrence of sugarbirds in the *P. roupelliae* woodland. A separate study in the same study area investigates rainfall since 1986/87 (De Swardt – in press). This study suggests that the relative amounts rainfall influence the flowering periods of *P. roupelliae* and subsequent influence on the timing of sugarbird movements.

The current study confirms not only the association of the species with the *Protea* habitat as their main food source (*Protea* nectar). They also feed on the insects associated with the flowers, and they utilise the *Protea* trees as nest sites and line nests with *Protea* seeds (de Swardt & Louw 1994, Smith 2005). The distribution pattern of the Sugarbird follows that of the particular *Protea* species which have a very limited range (de Swardt 1992, de Swardt 1997, SABAP2 unpubl. data).

Malachite Sunbirds and the other two nectarivore species (Greater Double-collared and Amethyst Sunbirds) were abundant at the *Protea* clumps as well. During particular seasons (when flower availability varied) they even occured in higher numbers than the other sunbird species. This phenomenon was observed especially in February 2011 at the Natalshoop study locality (16.4 ha) where more Greater Double-collared and Amethyst Sunbirds were observed and captured and fewer Malachite Sunbirds and Sugarbirds were present than at the other sites. The reverse was observed in November 2007 when more Malachite Sunbirds than Greater Double-collared and Amethyst Sunbirds were captured and observed. Greater Double-collared Sunbirds were also found on nearby forest margins and are not restricted to the *Protea* woodland (Smith 2005).

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Table 1: Birds captured in *Protea roupelliae* woodland between December 1986 – February 2011 at Lydenburg, Mpumalanga and in the eastern Free State.

Species	Ostrich 1993	This study (1993 - 2011)	TOTAL	% Occurrence	Main habitat
Gurney's Sugarbird	336	323	659	36.3	*Protea roupelliae* woodland
Malachite Sunbird	225	399	624	34.3	*Protea roupelliae* woodland
Greater DC Sunbird	51	68	119	6.5	*Protea roupelliae* woodland
Cape White-eye	27	50	77	4.2	*Protea roupelliae* woodland / montane forest
Amethyst Sunbird	26	34	60	3.3	*Protea roupelliae* woodland
Streaky-headed Seedeater	44	12	56	3.1	*Protea roupelliae* woodland
Dark-capped Bulbul	26	9	35	1.9	woodland
Cape Canary	20	9	29	1.6	*Protea roupelliae* woodland / woodland
Wailing Cisticola	3	12	15	0.8	mountain slopes
Cape Turtle Dove	11	3	14	0.7	woodland
Long-billed Pipit	6	7	13	0.7	mountain slopes
Cinnamon-breasted Bunting	6	5	11	0.6	mountain slopes / *Protea roupelliae* woodland
Buff-streaked Chat	4	5	9	0.5	mountain slopes
Familiar Chat	5	2	7	0.4	mountain slopes
Common Fiscal		7	7	0.4	woodland
Yellow Bishop		7	7	0.4	rank grass - thickets / montane grassland
Neddicky		6	6	0.3	woodland
Cape Robin-chat		5	5	0.3	montane forest
Cape Weaver		5	5	0.3	woodland
Cape Bunting	1	3	4	0.2	mountain slopes / *Protea roupelliae* woodland
Speckled Mousebird		3	3	0.1	woodland
Barn Swallow		3	3	0.1	montane grassland

Rock Martin		3	3	0.1	mountain slopes
Cape Rock Thrush	2	1	3	0.1	mountain slopes
African Stonechat		3	3	0.1	montane grassland
Lazy Cisticola		3	3	0.1	woodland / rank grass - thickets
Cape Longclaw	2	1	3	0.1	montane grassland
Black-throated Canary	3		3	0.1	*Protea roupelliae* woodland / woodland
Black-collared Barbet	2		2	0.1	woodland
Yellow-fronted Tinkerbird	1	1	2	0.1	woodland
Lesser Honeyguide	1	1	2	0.1	woodland
Olive Woodpecker	2		2	0.1	montane forest
Lesser Striped Swallow		2	2	0.1	montane grassland
Willow Warbler		2	2	0.1	woodland
Swee Waxbill		2	2	0.1	montane forest
Golden-breasted Bunting		2	2	0.1	*Protea roupelliae* woodland
Drakensberg Prinia		2	2	0.1	montane forest / rank grass - thickets
Olive Thrush	2		2	0.1	montane forest
Didric Cuckoo		1	1	0.05	woodland
Cardinal Woodpecker	1		1	0.05	woodland
Cape Grassbird	1		1	0.05	woodland / rank grass - thickets
Bar-throated Apalis	1		1	0.05	montane forest
Dusky Flycatcher		1	1	0.05	montane forest
Fairy Flycatcher		1	1	0.05	woodland
Puffback	1		1	0.05	montane forest
Red-winged Starling		1	1	0.05	woodland / *Protea roupelliae* woodland

Red-collared Widow	1		1	0.05	montain slopes / rank grass - thickets
Common Waxbill	1		1	0.05	montane grassland
Karoo Prinia		1	1	0.05	montane forest / rank grass - thickets
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