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NECTAR-FEEDING BY SOUTHERN AFRICAN BIRDS, WITH SPECIAL REFERENCE TO THE MOUNTAIN ALOE *ALOE MARLOTHII*

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Plants produce nectar as an evolutionary adaptation to attract various invertebrate and vertebrate pollinators. The adaptations shown by plants reflect the specific pollinator or suite of pollinators it aims to attract. Plants that attract birds as pollinators are known as ornitophilous plants. These plants possess various adaptations for this purpose, e.g. a sturdy perch to support the bird, dense clusters of scentless, tubular flowers in the yellow to red spectrum producing copious amounts of dilute nectar (Cronk and Ojeda 2008). A few specialised nectarivorous families have evolved independently in the Neotropics, e.g. hummingbirds (Trochlidae), Afrotropics, e.g. sunbirds (Nectariniidae) and Australasia, e.g. honeyeaters (Meliphagidae). These obligate nectarivores possess various adaptations to exploit this food source, e.g. bill size and shape, ability to hover (for some, e.g. hummingbirds), brush tongues etc. (Skead 1967; Maclean 1990). Other prominent albeit generally less specialised nectarivorous families include the American orioles (Icteridae), honeycreepers (Thraupidae), Hawaiian honeycreepers (Fringillidae, subfamily Drepanidinae), white-eyes (Zosteropidae), sugarbirds (Promeropidae) and the lories in the Psittacidae.

Opportunistic nectarivory by species not specifically adapted for this diet, i.e. facultative nectarivory, is common and widespread amongst birds although it wasn't recognised as such in early literature. Perhaps the earliest evidence of facultative nectarivory in southern Africa is ironically found in Rudolf Marloth's (after whom the Mountain Aloe *Aloe marlothii* was named) book *The Flora of South Africa* (Marloth 1915). Plate 22 in Marloth's (1915) book shows a photograph taken by Rudolf Marloth of a Karoo Scrub-robin *Cercotrichas coryphoeus* visiting a flowering *Protea cynaroides* on Table Mountain. The heading of Plate 22 is "*Protea cynaroides L with visiting bird (Ground Robin)*". However, Marloth (1915) does not specifically mention nectarivory by this species in the text.

McLachlan and Liversidge (1957) were the first to mention nectar-feeding by southern African birds other than the sunbirds or sugarbirds. They reported opportunistic nectarivory by four species in three passerine families. It was not until Oatley's (1964) detailed study of birds probing Mountain Aloe flowers in KwaZulu-Natal that it became evident opportunistic nectarivory may be far more widespread than previously thought. Excluding sunbirds and sugarbirds from his list, Oatley (1964) increased the list of southern African birds known to feed on nectar to 43 species representing 21 families, including five non-passerine families. Oatley and Skead (1972) extended the list of facultative nectarivores to 73 species by including all species that have been recorded probing for nectar - not only Mountain Aloe nectar. These authors brought the list of southern African birds known to feed on nectar (obligate and facultative) to 95 species in 23 families. Archer's (1992) observation of nectarivory at flowering Broad-leaved Coral Trees *Erythrina latissima* also resulted in the addition of a few previously unrecorded opportunistic nectarivores. Following a 3-year study of opportunistic nectarivores at flowering Mountain Aloes in the Suikerbosrand Nature Reserve in

Gauteng, South Africa, Symes (2010) reported that the list of opportunistic nectarivores feeding on Mountain Aloe nectar may exceed 77 species. If the true nectarivores (sunbirds and sugarbirds) are included in Symes' (2010) tally, an impressive 100 species have been recorded feeding on aloe nectar in southern Africa. Recently, Symes and Yoganand (2013) reported on opportunistic nectarivory at two *Schotia brachypetala* trees and another five species were added to the list of southern African opportunistic nectarivores. From the above it is evident that nectar-feeding by southern African birds is widespread, both geographically and across taxa.

Here we report on observations made mainly of birds associating with flowering Mountain Aloes in the Limpopo Province of South Africa. Mountain Aloes occur in open bushveld areas from KwaZulu-Natal northwards to Swaziland, Mozambique, Zimbabwe, Botswana, and the northern provinces of South Africa. They are large aloes and usually grow 2–4 m tall, although they may occasionally reach 6 m or more (Coates Palgrave 2002). The species common name refers to its association with ridges and steep slopes of mountains where they often form dense stands (Van Wyk and Smith 1996) (Fig. 1). The Mountain Aloe flowers during the dry winter months from June to August. The inflorescence is branched into about 10–30 mostly horizontally borne racemes that are 30–50 cm long. It exhibits several characteristics which makes it ideal for utilization by a range of bird species, namely possessing a sturdy, horizontal platform for perching for a variety of birds (Fig 2), yellow or orange flowers, absence of nectar guides, being scentless, having tubular perianths, an upwardly pointed floral posture, a relatively long distance between pollen and nectar, and production of large quantities of dilute nectar as the main pollinator reward (Cronk and Ojeda 2008; Symes and Nicolson 2008). We also conducted a comprehensive literature survey to present an updated list of all bird species that have been recorded feeding on nectar in southern Africa. This list also includes some observations by the authors of birds drinking nectar of plants other than the Mountain Aloe in other parts of southern Africa.

Fig 1 – A Mountain Aloe *Aloe marlothii* forest in the Polokwane Nature Reserve, Limpopo Province.

Methods

Flowering Mountain Aloes were visited on a random basis between 2005 and 2013 to record species associating with Mountain Aloes and to take photographs where possible. Unless otherwise stated, most records are from the Polokwane Plateau in South Africa's Limpopo Province. This is an ill-defined plateau falling roughly within S23°30" and S24°00" and E29°00" and E29°45". Incidental records of species probing for nectar on plants other than Mountain Aloes were also included but will be discussed separately. Birds that perched on flowers but were not actually seen probing/robbing were not included as nectar-feeders. No attempt was made to distinguish between nectar probers and nectar robbers as some species

Fig 2 – The horizontal racemes of *Aloe marlothii* are surprisingly sturdy and can easily support relatively large birds such as this Black-headed Heron *Ardea melanocephala*.

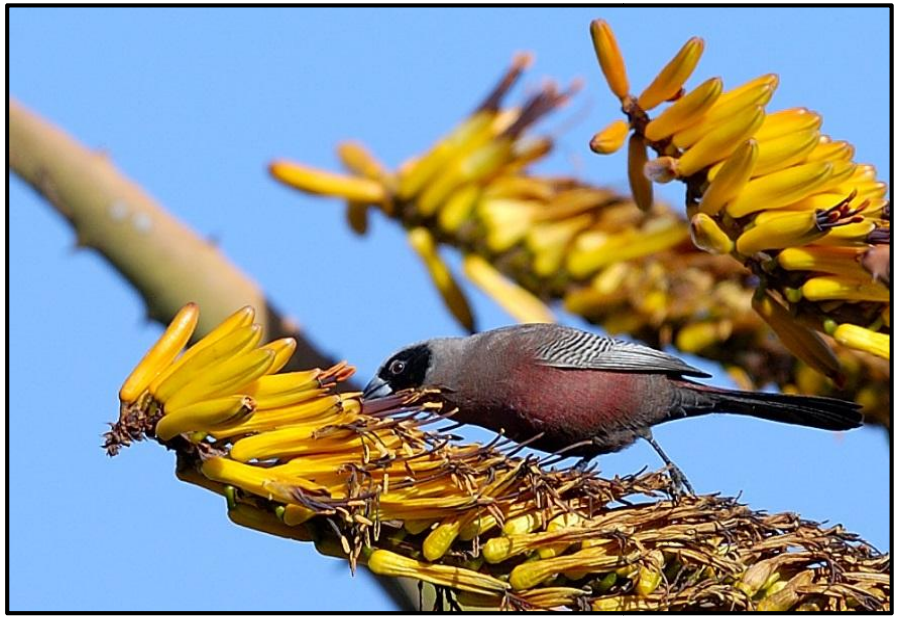

Fig 3 – Black-faced Waxbill *Estrilda erythronotos* drinking nectar that collected at the entrance to a Mountain Aloe *Aloe marlothii* flower.

performed both to a greater or lesser degree and it is often difficult to distinguish between the two from a distance.

In most instances the large volumes of nectar produced allowed species with short, conical bills such as canaries (Fringillidae) and waxbills (Estrildidae) to access nectar at the entrance to the flower without necessarily having to damage the flower to obtain it (Fig 3). Nectar-robbing was therefore often only necessary if a particular flower's nectar was depleted by, for example, the same or another bird visiting the flower shortly before (Fig 4). Another problem with defining nectar-feeding was delineating its boundaries. Does consumption of flowers constitute a form of nectarivory? The "problematic" species here included mousebirds (Coliidae), Grey Go-away-bird *Corythaixoides concolor* (Musophagidae), parrots (Psittacidae), hornbills (Bucerotidae) and crows (Corvidae), all of which have been recorded as "probing" or gathering at mass flowering events of nectar-producing plants in earlier studies (Oatley 1964; Oatley and Skead 1972; Kemp 1995; Symes *et al.* 2008; Symes 2010). Since flowers constitute a part of the "usual" diet of some of these species in anyway, the question may be asked whether they were attracted to the nectar or the flowers. According to Kemp (2005), the Trumpeter Hornbill *Bycanistes bucinator* "occasionally eats nectar-rich flowers". This suggests some form of opportunistic behaviour, similar to the opportunistic behaviour exhibited by facultative nectarivores that probe or rob flowers for their

Fig 4 – An example of nectar-robbing by a Streaky-headed Seed-eater *Crithagra gularis*.

nectar. In all probability it is the size and shape of a hornbill's bill that makes probing for nectar difficult, resulting in them swallowing flowers instead. If flowers are included, should species feeding on fallen flowers below Mountain Aloes be recorded too? We have observed francolins, spurfowls (Phasianidae) and even the Common Ostrich *Struthio camelus* feeding on fallen flowers. In this regard, we took the lead of previous authors and included species eating nectar-producing flowers in the list, provided they were not feeding on flowers that had fallen on the ground. Another difficulty was determining if probing was indeed directed at obtaining nectar, or perhaps insects attracted to the flowers, or both? The problem species here were the woodpeckers (Picidae) and shrikes (Laniidae and Malaconotidae) in particular. Since these species have been recorded probing for nectar in earlier studies, and we have sufficient evidence that they were indeed probing for nectar in at least some instances, we decided to include these species in the list of opportunistic nectarivores.

Results and discussion

Excluding the sunbirds and sugarbirds, 74 species belonging to 24 families were recorded feeding on nectar during the course of this study. Seventeen of these species represent new records of birds feeding on nectar and details of the observations are given below. With the exception of the Orange River White-eye *Zosterops pallidus*, all the new records were of birds observed feeding on Mountain Aloe nectar.

After gathering and cross-checking all published records of nectar-feeding by southern African birds (according to the criteria mentioned above), and including the 17 new records reported here, the southern African list of nectar-feeding birds now stands at 157 species in 29 families (Table 1). The 29 families include 10 non-passerine families representing 28 species and 19 passerine families representing 129 species (Table 1). Only one new family was added using our criteria, namely the hornbills (Bucerotidae). Two-thirds (105 species) of the 157 bird species known to feed on nectar in southern Africa have now been recorded feeding on Mountain Aloe nectar.

A brief description of the seventeen new records of opportunistic nectarivory follows:

Southern Yellow-billed Hornbill *Tockus leucomelas*

For many years we only had records of this species eating Mountain Aloe flowers that had fallen on the ground below. In July 2012, three birds were actually observed eating mature Mountain Aloe flowers

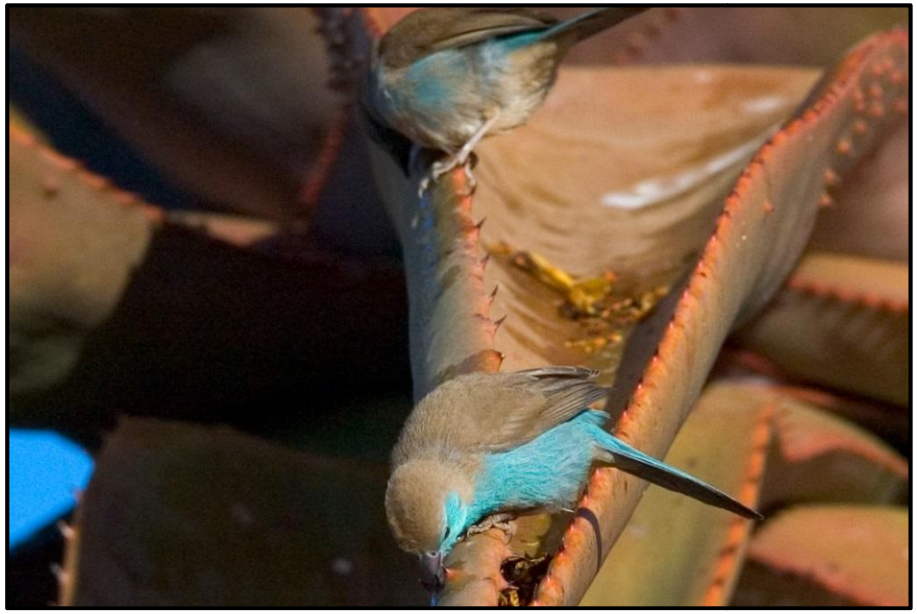

Fig 5 – Blue Waxbills *Uraeginthus angolensis* drinking nectar that had dripped onto the leaves of the Mountain Aloe *Aloe marlothii*.

directly from the raceme on the farm Al3 De Loskop on the north-western edge of the Polokwane Plateau.

Red-eyed Dove *Streptopelia semitorquata*
This was an irregular nectar feeder at various Mountain Aloe flowering events on the Polokwane Plateau throughout the study period.

Golden-tailed Woodpecker *Campethera abingoni*
A single bird was recorded probing for nectar at several individual Mountain Aloes in the Polokwane Nature Reserve in July 2008.

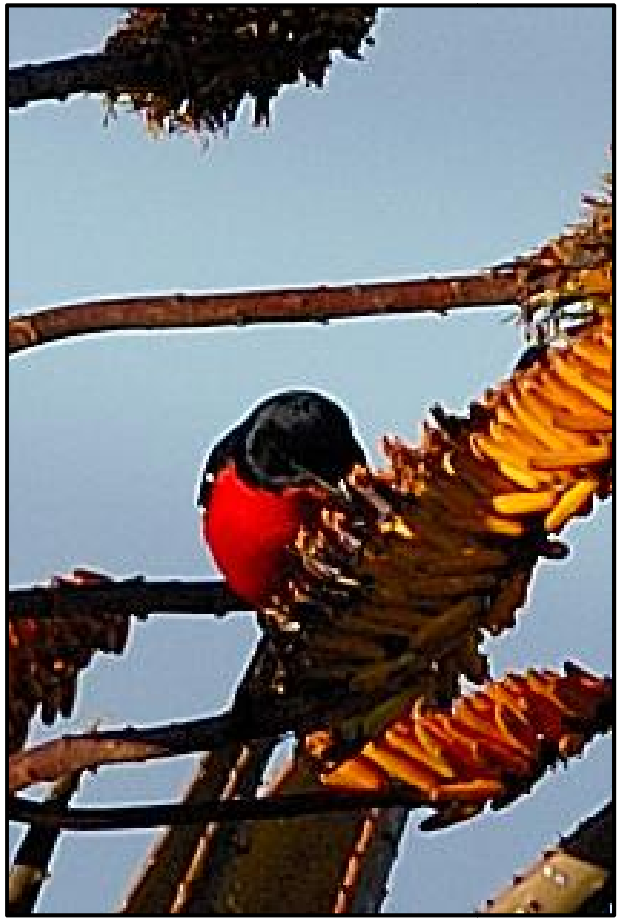

Fig 6 – The Crimson-breasted Shrike *Laniarius atrococcineus* was a regular prober at Mountain Aloe *Aloe marlothii* flowers.

Red-throated Wryneck *Jynx ruficollis*
The Red-throated Wryneck is an uncommon species on the Polokwane Plateau and a single bird was recorded probing at a stand of Mountain Aloes in the Polokwane Nature Reserve in July 2005. It is possible that this individual may have been attracted to the

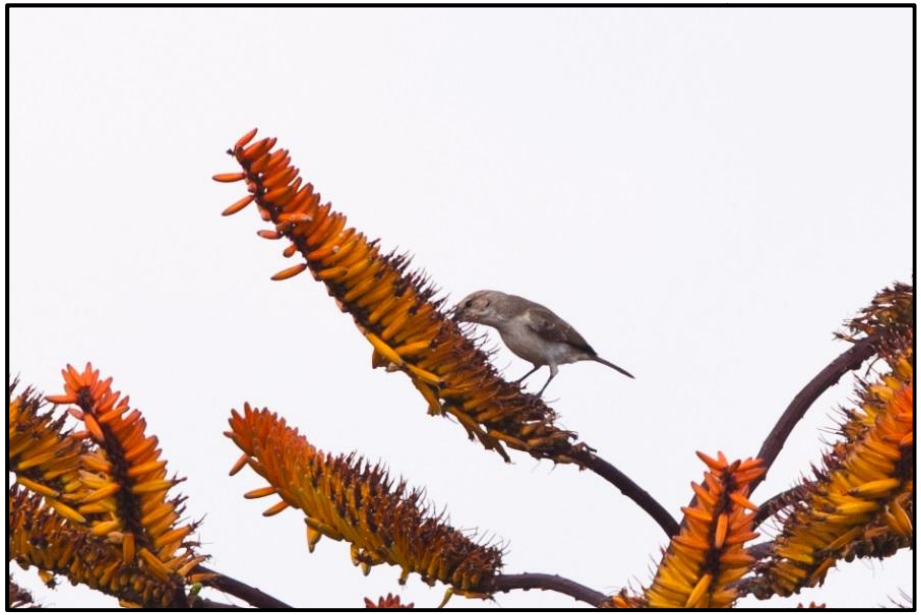

Fig 7 – The Marico Flyctacher *Bradornis mariquensis* is an irregular prober of Mountain Aloe *Aloe marlothii* flowers on the Polokwane Plateau.

mass flowering event as it was not recorded in the area before or after the flowering period, nor was it recorded in the area since. This species' usual diet includes ants, their eggs and pupae and termites. It is possible that the species was exploiting an abundant source of ants attracted to nectar.

Blue Waxbill *Uraeginthus angolensis*

This species was observed probing Mountain Aloe flowers on a few occasions at scattered localities on the Polokwane Plateau. It sometimes drank or scooped nectar that had dripped onto the leaves below too (Fig 5).

Fig 8 – Cape Penduline-tits *Anthoscopus minutus* attending a flowering Mountain Aloe *Aloe marlothii* in the Polokwane Nature Reserve, Limpopo Province. The bird below was busy probing flowers for nectar.

Southern White-crowned Shrike *Eurocephalus anguitimens*

A group of six birds were seen probing flowers Mountain Aloe flowers in June 2012 and July 2013 on the farm Al3 De Loskop. Both

sightings were at the same stand of aloes and it is possibly the same flock of birds that were recorded on both occasions.

Crimson-breasted Shrike *Laniarius atrococcineus*
This is a regular prober of Mountain Aloe flowers on the Polokwane Plateau (Fig 6).

Marico Flycatcher *Bradornis mariquensis*
A few birds were seen probing for nectar at a flowering stand of Mountain Aloes on the farm Al3 De Loskop in July 2013 (Fig 7).

Cape Penduline Tit *Anthoscopus minutus*
They are regular probers of Mountain Aloe flowers on the Polokwane Plateau and, in typical penduline-tit style, often access the nectar while hanging upside-down (Fig 8).

Ashy Tit *Parus cinerascens*
The Ashy Tit can be described as a nectar addict and was recorded probing for Mountain Aloe nectar on many occasions at several localities on the Polokwane Plateau (Fig 9).

White-browed Sparrow-weaver *Plocepasser mahali*
This species is also a Mountain Aloe nectar addict on the Polokwane Plateau (Fig 10).

Red-billed Buffalo-weaver *Bubalornis niger*
A small flock of five birds were recorded probing and scooping Mountain Aloe nectar that had dripped onto the leaves below the inflorescence in the Polokwane Nature Reserve in July 2005. The species is a vagrant to the Polokwane Plateau and it is possible that these birds may have tracked stands of flowering Mountain Aloes before it was recorded in Polokwane Nature Reserve.

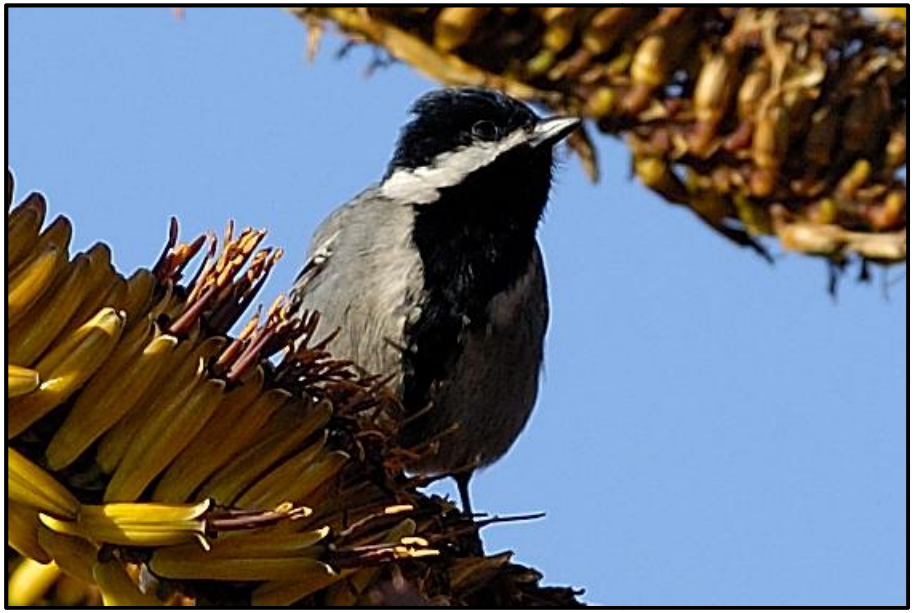

Fig 9 – Ashy Tit *Parus cinerascens* attending a flowering Mountain Aloe *Aloe marlothii*.

Red-billed Oxpecker *Buphagus erythrorhynchus*
Although Symes (2010) never actually saw this species exploiting nectar, it was included in the list of opportunistic nectarivores by its association with a flowering event. We recorded the species probing for nectar on two separate occasions in July 2005 and August 2008. Interestingly however, some individuals were also seen "probing" between immature flowers suggesting that they may have been attracted to invertebrates associated with the flowering racemes (Fig 11). It is advised that future observations and documenting of this species associating with aloe flowers should be done with the necessary accuracy.

Fig 10 – White-browed Sparrow-weavers *Plocepasser mahali* are nectar addicts as is shown by the pollen stained face of this individual.

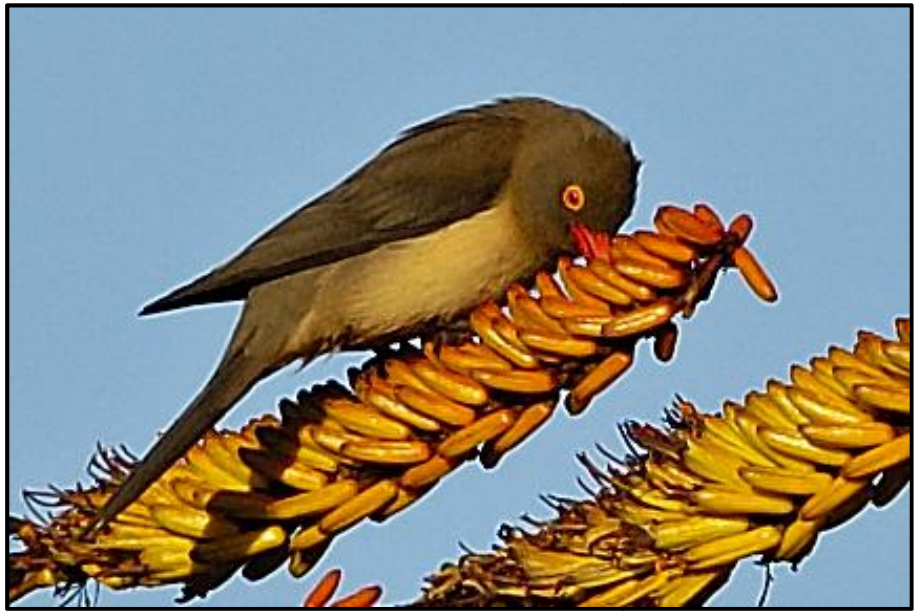

Fig 11 – Red-billed Oxpecker *Buphagus erythrorhynchus* appearing to rob immature Mountain Aloe *Aloe marlothii* flowers.

Southern Pied Babbler *Turdoides bicolor*
They regular attended flowering Mountain Aloes at Al3 De Loskop and can be described as nectar addicts (Fig 12).

Orange River White-eye *Zosterops pallidus*
The addition of this species to the list of nectar-feeding birds is by default, rather than representing an unusual record. The most recent regional text of southern African birds does not specifically mention this species feeding on nectar (see Bowie 2005a). We were also unable to find any other published records of white-eyes drinking nectar with the distribution range of the Orange River White-eye. This is undoubtedly due to the relatively recent elevation of the Orange River White-eye as a distinct species (see Oatley *et al.* 2012). As anyone living within its range will attest, the species is a regular prober of a variety of nectar-producing plants. For the record, our first sighting of this species probing for nectar was on a flowering *Aloe dichotoma* at Augrabies Falls National Park in July 2010.

Red-billed Quelea *Quelea quelea*
This rather unusual record was of a single bird probing Mountain Aloe flowers together with a small group of Southern Masked-weavers at Al3 De Loskop in July 2013.

Greater Blue-eared Starling *Lamprotornis chalybaeus*
Although this species has been recorded feeding on nectar in East Africa (Cunningham-Van Someron 1974), we were unable to find

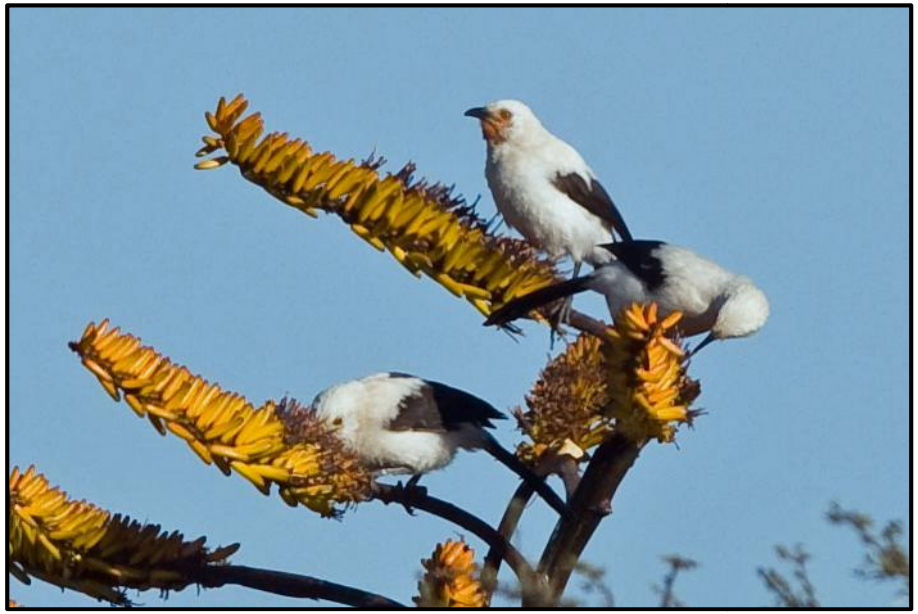

Fig 12 – Southern Pied Babblers *Turdoides bicolor* are nectar addicts and regularly attend flowering Mountain Aloes *Aloe marlothii*.

Fig 13 – Amethyst Sunbird *Chalcomitra amethystine* probing for nectar at a Mountain Aloe *Aloe marlothii*.

references to this behaviour in southern Africa. Five birds were seen probing Mountain Aloes approximately 10 km north-west of Olifants Rest Camp in the Kruger National Park in June 2012.

In addition to these new records, our list also includes six sunbird species and another nine opportunistic nectarivores that have not previously been recorded exploiting Mountain Aloe flowers for nectar (Table 1). The new records for Mountain Aloe nectarivory by sunbirds are (only the location of the first sighting is given): Amethyst Sunbird *Chalcomitra amethystina* in Polokwane in the Limpopo Province in July 2005 (Fig 13), Collared Sunbird *Anthodiaeta collaris* at Letaba Camp in the Kruger National Park in July 2012 (Fig 14), Greater Double-collared Sunbird *Cinnyris afer* on the outskirts of Tzaneen in the Limpopo Province (August 2012), Southern Double-collared Sunbird *Cinnyris chalybeus* at Kurisa Moya Lodge near Woodbush in the Limpopo Province (June 2011), Marico Sunbird *Cinnyris mariquensis* at Tembele Country Estate near Polokwane in the Limpopo Province in July 2008 (Fig 15), and Scarlet-chested Sunbird *Chalcomitra senegalensis* at Skukuza Rest Camp in the Kruger National Park, Mpumlanga in July 2013 (Fig 16). The nine "new" opportunistic nectarivores recorded exploiting Mountain Aloes for their nectar during this study were: Green Wood-hoopoe *Phoeniculus purpureus* in the Polokwane Nature Reserve (June 2006), Square-tailed Drongo *Dicrurus ludwigii* at Kurisa Moya Lodge

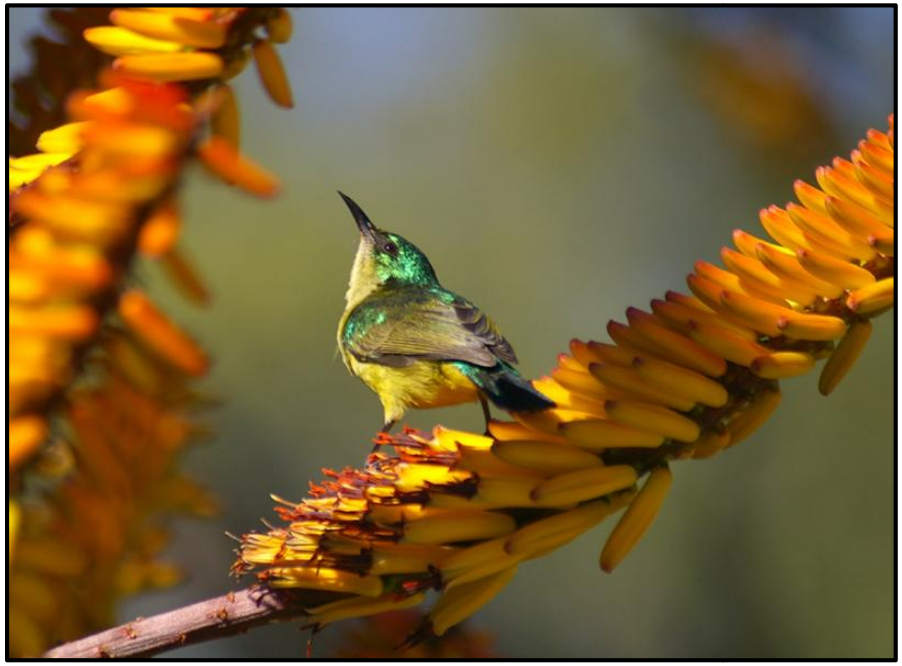

Fig 14 – Collared Sunbird *Hedydipna collaris* attending a Mountain Aloe *Aloe marlothii*.

Fig 15 – Marico Sunbirds *Cinnyris mariquensis* are regular feeders at flowering Mountain Aloes *Aloe marlothii*.

(June 2011), Yellow Canary *Crithagra flaviventris* at Al3 De Loskop (July 2012), Cape Sparrow *Passer melanurus* in the Polokwane Nature Reserve (June 2005), Lesser Masked Weaver *Ploceus intermedius* in the Polokwane Nature Reserve (June 2005), Red-headed Weaver *Anaplectes rubriceps* in Shingwedzi Rest Camp in the Kruger National Park in July 2011, Common Myna *Acridotheres tristis* in suburban Polokwane, Yellow-bellied Eremomela *Eremomela icteropygialis* in the Polokwane Nature Reserve (July 2007), and Burchell's Starling *Lamprotornis australis* in the Sabi Sand Game Reserve in July 2009 (L Thamm, pers. comm., see http://www.operationwildflower.org.za).

Two species were not included in the list of southern African nectarivores. The Magpie Mannikin *Spermestes fringilloides* has only been recorded drinking nectar in captivity (Brickell and Konigkramer 1997) and there are no published records of this behaviour in wild birds from anywhere within its range. The Miombo Blue-eared Starling *Lamprotornis elisabeth* was formerly considered conspecific with the Lesser Blue-eared Starling *Lamprotornis chloropterus.* The only published record of nectarivory by this species complex is based on observations made of birds drinking nectar of *Bombax* spp. in

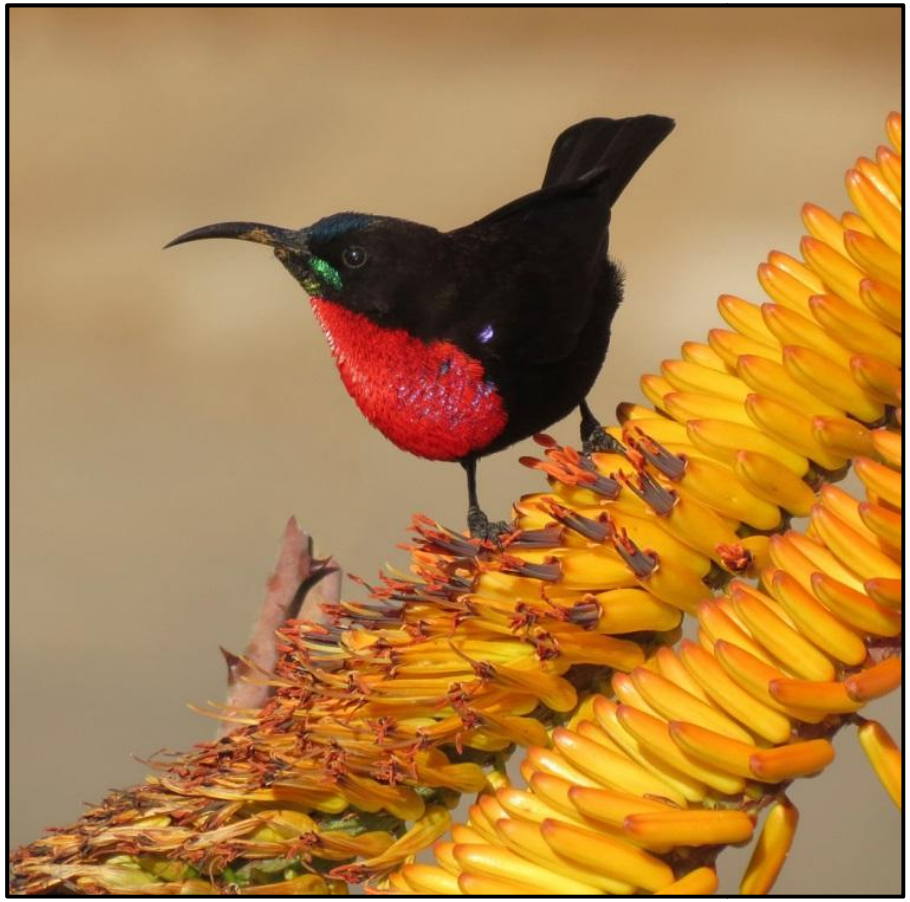

Fig 16 – Scarlet-chested Sunbird *Chalcomitra senegalensis* at flowering Mountain Aloe *Aloe marlothii* (© Almari Robbertse).

West Africa (see Craig and Freare 2009). As such this record would constitute nectarivory by the Lesser Blue-eared Starling meaning there are no confirmed records of nectarivory by the Miombo Blue-eared Starling in southern Africa.

Although our list represents a substantial increase in the number of opportunistic nectarivores in southern Africa as well as some new food plants for several sunbirds and other opportunistic nectarivores, it should be noted that most records reported here are based on observations made in the Limpopo Province. There have been no previous studies on the occurrence of opportunistic nectarivory in the Limpopo Province and our records represent a "new" geographical range for this type of behaviour. The addition of several new species is therefore to be expected. Observations of birds engaging in opportunistic nectarivory in other geographical areas are also likely to boost the list of nectar-feeding birds even more. In this regard, records of opportunistic nectarivory from Mozambique, Zimbabwe, Botswana and Namibia are scant. The same holds for nectar-feeding at other nectar-producing plants as was shown by Symes and Yoganand (2013). Their observations at two flowering *Schotia brachypetala* trees increased the list of southern African nectarivores by another five species.

The list of species known to feed on the nectar of Mountain Aloe may well exceed our tally of 104 species. Many published records of nectarivory simply states "feeding on the nectar of *Aloe* species", with no specific details of the particular *Aloe* species involved. In all studies of the diet of species, the correct identification of the plant species involved is of utmost importance. This, together with such information as date and locality has the potential to make a tremendous contribution to our knowledge of the spatial and temporal distribution of both obligate and opportunistic nectarivores. It will also be interesting to establish just exactly how opportunistic different species are by recording the different nectar-producing species they exploit. We urge observers interested in this kind of behaviour to include the aforementioned in their reports of nectarivory. Photographs of nectarivory, regardless of the quality of the image, can also be useful to describe the type of nectarivory, e.g.

probing or robbing, or clarify whether the bird was eating insects rather than drinking nectar.

Conclusion

The list of southern African birds known to feed on nectar now stands at an impressive 157 species of which 67% have been recorded feeding on the nectar of the Mountain Aloe. We echo Symes' (2010) sentiment that the Mountain Aloe may well rate amongst the plants which attracts the highest number and most diverse assemblage of bird species of any single plant species in the world.

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Table 1. Southern African birds that have been recorded feeding on nectar and those that have been recorded feeding specifically on Mountain Aloe *Aloe marlothii* nectar. Species marked with an asterisk (*) were recorded feeding on nectar during this study. Species in green represent new additions to the list of southern African opportunistic nectarivores. Species highlighted in red are species that have been record feeding on nectar in the past, but represent new additions to species feeding specifically on Mountain Aloe nectar.

Family and Species	*Scientific Name*	*Aloe marlothii*	References
Non-passerines			
Bucerotidae			
***Hornbill, Southern Yellow-billed**	***Tockus leucomelas***	✓	**This study**
Hornbill, Trumpeter	*Bycanistes bucinator*		Kemp (1995)
Coliidae			
*Mousebird, Red-faced	*Urocolius indicus*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010) Symes and Yoganand (2013)
*Mousebird, Speckled	*Colius striatus*	✓	Oatley (1964) Oatley and Skead (1972) Archer (1992) Symes *et al.* (2008) Symes (2010) Symes and Yoganand (2013)
Mousebird, White-backed	*Colius colius*		Oatley and Skead (1972)
Columbidae			
*Dove, Cape Turtle	*Streptopelia capicola*	✓	Oatley (1964) Symes *et al.* (2008)
*Dove, Laughing	*Streptopelia senegalensis*	✓	Oatley (1964) Symes *et al.* (2008)
***Dove, Red-eyed**	***Streptopelia semitorquata***	✓	**This study**

Family and Species	*Scientific Name*	*Aloe marlothii*	References
Indicatoridae			
*Honeyguide, Lesser	*Indicator minor*	✓	Oatley and Skead (1972) Symes *et al.* (2008)
Lybiidae			
*Barbet, Acacia Pied	*Tricholaema leucomelas*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
*Barbet, Black-collared	*Lybius torquatus*	✓	Oatley (1964) Oatley and Skead (1972) Archer (1992) Symes *et al.* (2008) Symes (2010) Symes and Yoganand (2013)
*Barbet, Crested	*Trachyphonus vaillantii*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Symes and Yoganand (2013)
Barbet, White-eared	*Stactolaema leucotis*	✓	Oatley (1964)
Barbet, Whyte's	*Stactolaema whytii*		Archer (1992)
Tinkerbird, Red-fronted	*Pogoniulus pusillus*	✓	Oatley (1964)
*Tinkerbird, Yellow-fronted	*Pogoniulus chrysoconus*	✓	Archer (1992) Symes (2010)
Tinkerbird, Yellow-rumped	*Pogoniulus bilineatus*	✓	Oatley and Skead (1972) Symes and Yoganand (2013)
Musophagidae			
*Go-away-bird, Grey	*Corythaixoides concolor*	✓	Oatley and Skead (1972) Symes (2010)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
Phoeniculidae			
***Wood-hoopoe, Green**	***Phoeniculus purpureus***	✓	Oatley and Skead (1972) Symes and Yoganand (2013)
Picidae			
*Woodpecker, Cardinal	*Dendropicos fuscescens*	✓	Symes *et al.* (2008) Symes (2010)
***Woodpecker, Golden-tailed**	***Campethera abingoni***	✓	**This study**
***Wryneck, Red-throated**	***Jynx ruficollis***	✓	**This study**
Psittacidae			
Parakeet, Rose-ringed	*Psittacula krameri*		Perrin and Cowgill (2005)
Parrot, Brown-headed	*Poicephalus cryptoxanthus*	✓	Oatley (1964)
Parrot, Cape	*Poicephalus robustus*		Oatley and Skead (1972)
Parrot, Meyer's	*Poicephalus meyeri*		Rowan (1983)
Parrot, Rüppell's	*Poicephalus rueppellii*		Rowan (1983)
Rhinopomastidae			
*Scimitarbill, Common	*Rhinopomastus cyanomelas*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010) Symes and Yoganand (2013)
Passerines			
Cisticolidae			
Apalis, Bar-throated	*Apalis thoracica*	✓	Symes *et al.* (2008) Symes (2010)
Apalis, Rudd's	*Apalis ruddi*	✓	Oatley (1964)
*Apalis, Yellow-breasted	*Apalis flavida*	✓	Oatley (1964) Symes and Yoganand (2013)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
*Cisticola, Rattling	*Cisticola chiniana*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
*Neddicky	*Cisticola fulvicapilla*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
*Prinia, Black-chested	*Prinia flavicans*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
Prinia, Drakensberg	*Prinia hypoxantha*		Oatley and Skead (1972)
Prinia, Karoo	*Prinia maculosa*		Forbes *et al.* (2009)
*Prinia, Tawny-flanked	*Prinia subflava*	✓	Oatley (1964) Oatley and Skead (1972) Symes and Yoganand (2013)
Corvidae			
Crow, House	*Corvus splendens*		Maclean (1993)
Crow, Pied	*Corvus albus*		Oatley and Skead (1972)
Raven, White-necked	*Corvus albicollis*	✓	Oatley (1964)
Dicruridae			
*Drongo, Fork-tailed	*Dicrurus adsimilis*	✓	Oatley (1964) Oatley and Skead (1972) Forbes *et al.* (2009) Symes (2010) Symes and Yoganand (2013)
***Drongo, Square-tailed**	***Dicrurus ludwigii***	✓	Maclean (1993)
Estrildidae			
*Firefinch, Jameson's	*Lagonosticta rhodopareia*	✓	Symes *et al.* (2008) Symes (2010)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
*Mannikin, Bronze	*Spermestes cucullata*		Woodall (1975)
Mannikin, Red-backed	*Spermestes bicolor*		Stidolph (1969)
*Pytilia, Green-winged	*Pytilia melba*	✓	Symes *et al.* (2008) Symes (2010)
*Waxbill, Black-faced	*Estrilda erythronotos*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
***Waxbill, Blue**	***Uraeginthus angolensis***	✓	**This study**
Waxbill, Common	*Estrilda astrild*		Oatley and Skead (1972)
*Waxbill, Grey	*Estrilda perreini*		Nuttall (2005)
*Waxbill, Violet-eared	*Uraeginthus granatinus*	✓	Symes *et al.* (2008) Symes (2010)
Waxbill, Yellow-bellied	*Coccopygia quartinia*		Archer (1992)
Fringillidae			
Bunting, Cape	*Emberiza capensis*	✓	Symes *et al.* (2008) Symes (2010)
Bunting, Cinnamon-breasted	*Emberiza tahapisi*		Symes (2010)
*Canary, Black-throated	*Crithagra atrogularis*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
Canary, Brimstone	*Crithagra sulphurata*	✓	Oatley (1964) Milewski (1978) Archer (1992)
Canary, Forest	*Serinus scotops*		Symes and Yoganand (2013)
***Canary, Yellow**	***Crithagra flaviventris***	✓	Oatley and Skead (1972) Milewski (1978)
*Canary, Yellow-fronted	*Crithagra mozambica*	✓	Oatley (1964) Oatley and Skead (1972) Archer (1992)
Canary, White-throated	*Crithagra albogularis*		Milewski (1978)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
Seedeater (Canary), Protea	*Crithagra leucoptera*		Milewski (1978) Fraser and Richardson (1989)
*Seedeater, Streaky-headed	*Crithagra gularis*	✓	Oatley (1964) Oatley and Skead (1972) Milewski (1978) Archer (1992) Symes *et al.* (2008) Forbes *et al.* (2009) Symes (2010)
Seedeater, Black-eared	*Crithagra mennelli*		Vernon (1979)
Siskin, Cape	*Crithagra totta*		Milewski (1978)
Laniidae			
*Fiscal, Common	*Lanius collaris*	✓	Symes *et al.* (2008)
***Shrike, Southern White-crowned**	***Eurocephalus anguitimens***	✓	**This study**
Malaconotidae			
Boubou, Southern	*Laniarius ferrugineus*	✓	Oatley (1964) Oatley and Skead (1972) Symes and Yoganand (2013)
***Shrike, Crimson-breasted**	***Laniarius atrococcineus***	✓	**This study**
Tchagra, Brown-crowned	*Tchagra australis*	✓	Symes *et al.* (2008) Symes (2010)
Motacillidae			
Pipit, Tree	*Anthus trivialis*		Maclean (1993)
Muscicapidae			
Chat, Buff-streaked	*Campicoloides bifasciata*		Oatley and Skead (1972)
Chat, Mocking Cliff	*Thamnolaea cinnamomeiventris*		Oatley and Skead (1972)
Flycatcher, African Dusky	*Muscicapa adusta*		Symes (2010)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
*Flycatcher, Fiscal	*Sigelus silens*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes *et al.* (2010)
***Marico Flycatcher**	***Bradornis mariquensis***	✓	**This study**
Flycatcher, Pale	*Bradornis pallidus*		Oatley (1964)
*Flycatcher, Southern Black	*Melaenornis pammelaina*	✓	Oatley (1964)
Robin-chat, Cape	*Cossypha caffra*	✓	Symes *et al.* (2008) Symes (2010)
Scrub-robin, White-browed	*Erythropygia leucophrys*	✓	Oatley (1964)
Thrush, Kurrichane	*Turdus libonyanus*		Symes and Yoganand (2013)
Thrush, Karoo	*Turdus smithi*		Symes and Yoganand (2013)
Thrush, Cape Rock	*Monticola rupestris*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Forbes *et al.* (2009) Symes (2010)
Nectariniidae (References only given for species recorded probing *Aloe marlothii*)			
Sunbird, Amethyst	***Chalcomitra amethystina***	✓	**This study**
Sunbird, Bronzy	*Nectarinia kilimensis*		
Sunbird, Copper	*Cinnyris cupreus*		
Sunbird, Collared	***Anthodiaeta collaris***	✓	**This study**
Sunbird, Dusky	*Cinnyris fuscus*	✓	Bowie (2005b)
Sunbird, Greater Double-collared	***Cinnyris afer***	✓	**This study**
Sunbird, Grey	*Cyanomitra veroxii*		
Sunbird, Malachite	*Nectarinia famosa*	✓	Brown (2005) Symes *et al.* (2008) Symes (2010)
Sunbird, Marico	***Cinnyris mariquensis***	✓	**This study**
Sunbird, Miombo Double-collared	*Cinnyris manoensis*		
Sunbird, Neergaard's	*Cinnyris neergaardi*		

Family and Species	*Scientific Name*	*Aloe marlothii*	References
Sunbird, Olive	*Cyanomitra olivacea*		
Sunbird, Orange-breasted	*Anthobaphes violacea*		
Sunbird, Plain-backed	*Anthreptes reichenowi*		
Sunbird, Purple-banded	*Cinnyris bifasciatus*		
Sunbird, Scarlet-chested	***Chalcomitra senegalensis***	✓	**This study**
Sunbird, Shelley's	*Cinnyris shelleyi*		
Sunbird, Southern Double-collared	***Cinnyris chalybeus***	✓	**This study**
Sunbird, Variable	*Cinnyris venustus*		
Sunbird, Western Violet-backed	*Anthreptes longuemarei*		
Sunbird, White-bellied	*Cinnyris talatala*	✓	Symes *et al.* (2008) Symes (2010)
Oriolidae			
*Oriole, Black-headed	*Oriolus larvatus*	✓	Oatley (1964) Oatley and Skead (1972) Archer (1992) Symes (2010) Symes and Yoganand (2013)
Paridae			
***Penduline-Tit, Cape**	***Anthoscopus minutus***	✓	**This study**
*Penduline-Tit, Grey	*Anthoscopus caroli*	✓	Oatley (1964)
***Tit, Ashy**	***Parus cinerascens***	✓	**This study**
*Tit, Southern Black	*Parus niger*	✓	Oatley (1964) Oatley and Skead (1972)
Passeridae			
*Petronia, Yellow-throated	*Gymnoris superciliaris*	✓	Oatley (1964) Oatley and Skead (1972) Forbes *et al.* (2008)
***Sparrow, Cape**	***Passer melanurus***	✓	Oatley and Skead (1972)
*Sparrow, House	*Passer domesticus*	✓	Oatley and Skead (1972)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
*Sparrow, Southern Grey-headed	*Passer diffusus*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
Ploceidae			
Bishop, Southern Red	*Euplectes orix*		Fraser and McMahon (1989)
***Sparrow-Weaver, White-browed**	***Plocepasser mahali***	✓	**This study**
Weaver, Golden	*Ploceus xanthops*		Lorber (1982)
*Weaver, Cape	*Ploceus capensis*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Forbes *et al.* (2009) Symes (2010)
Weaver, Chestnut	*Ploceus rubiginosus*	✓	Craig (2004)
Weaver, Dark-backed	*Ploceus bicolor*	✓	Oatley (1964) Oatley and Skead (1972)
***Weaver, Lesser Masked**	***Ploceus intermedius***	✓	Maclean (1993)
***Weaver, Red-billed Buffalo**	***Bubalornis niger***	✓	**This study**
***Weaver, Red-headed**	***Anaplectes rubriceps***	✓	Symes and Yoganand (2013)
*Weaver, Southern Masked	*Ploceus velatus*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
*Weaver, Spectacled	*Ploceus ocularis*	✓	Oatley (1964) Oatley and Skead (1972) Archer (1992)
Weaver, Thick-billed	*Amblyospiza albifrons*		Symes and Yoganand (2013)
*Weaver, Village	*Ploceus cucullatus*	✓	Oatley (1964) Oatley and Skead (1972) Archer (1992)
Weaver, Yellow	*Ploceus subaureus*	✓	Oatley (1964) Oatley and Skead (1972)
Widowbird, Red-collared	*Euplectes ardens*	✓	Oatley and Skead (1972)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
			Archer (1992)
			Symes *et al.* (2008)
			Symes (2010)
Widowbird, White-winged	*Euplectes albonotatus*		Oatley and Skead (1972)
***Quelea, Red-billed**	***Quelea quelea***	✓	**This study**
Promeropidae			
Sugarbird, Cape	*Promerops cafer*		
Sugarbird, Gurney's	*Promerops gurneyi*		
Pycnonotidae			
Brownbul, Terrestrial	*Phyllastrephus terrestris*		Oatley (1964)
			Symes and Yoganand (2013)
*Bulbul, African Red-eyed	*Pycnonotus nigricans*	✓	Oatley and Skead (1972)
			Symes *et al.* (2008)
Bulbul, Cape	*Pycnonotus capensis*		Maclean (1993)
*Bulbul, Dark-capped	*Pycnonotus tricolor*	✓	Oatley (1964)
			Oatley and Skead (1972)
			Archer (1992)
			Symes and Yoganand (2013)
			Forbes *et al.* (2009)
Greenbul, Sombre	*Andropadus importunus*	✓	Oatley (1964)
			Oatley and Skead (1972)
			Symes (2010)
			Symes and Yoganand (2013)
Sturnidae			
***Myna, Common**	***Acridotheres tristis***	✓	Symes and Yoganand (2013)
***Oxpecker, Red-billed**	***Buphagus erythrorhynchus***	✓	**This study**
Starling, Black-bellied	*Notopholia corrusca*	✓	Oatley (1964)
Starling, Burchell's	*Lamprotornis australis*	✓	Palmer and Pitman (1972)
			L Thamm pers. comm.
			P De Waal pers. comm. (see www.sntc.org.sz)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
*Starling, Cape Glossy	*Lamprotornis nitens*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Forbes *et al.* (2009) Symes (2010) Symes and Yoganand (2013)
Starling, Common	*Sturnus vulgaris*		Skead (1995)
***Starling, Greater Blue-eared**	***Lamprotornis chalybaeus***	✓	**This study**
Starling, Pale-winged	*Onychognathus nabouroup*		Craig (2005)
Starling, Pied	*Lamprotornis bicolor*	✓	Oatley and Skead (1972) Symes *et al.* (2008)
*Starling, Red-winged	*Onychognathus morio*	✓	McLachlan and Liversidge (1957) Oatley and Skead (1972) Archer (1992) Forbes *et al.* (2009) Symes (2010) Symes and Yoganand (2013)
*Starling, Wattled	*Creatophora cinerea*	✓	Symes *et al.* (2008) Symes (2010)
Sylviidae			
*Babbler, Arrow-marked	*Turdoides jardineii*	✓	Oatley (1964) Symes and Yoganand (2013) Oatley and Skead (1972)
***Babbler, Southern Pied**	***Turdoides bicolor***	✓	**This study**
*Crombec, Long-billed	*Sylvietta rufescens*	✓	Oatley (1964) Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010) Symes and Yoganand (2013)
*Eremomela, Burnt-necked	*Eremomela usticollis*	✓	Oatley (1964)
***Eremomela, Yellow-bellied**	***Eremomela icteropygialis***	✓	Oatley and Skead (1972)

Family and Species	*Scientific Name*	*Aloe marlothii*	References
Grassbird, Cape	*Sphenoeacus afer*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
*Tit-Babbler, Chestnut-vented	*Sylvia subcaerulea*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Symes (2010)
Zosteropidae			
White-eye, African Yellow	*Zosterops senegalensis*	✓	Oatley (1964) Archer (1992) Symes and Yoganand (2013)
*White-eye, Cape	*Zosterops capensis*	✓	Oatley and Skead (1972) Symes *et al.* (2008) Forbes *et al.* (2009) Symes (2010) Symes and Yoganand (2013)
***White-eye, Orange River**	***Zosterops pallidus***		**This study: *Aloe dichotoma***