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:
Cizek AF 2012. What is the status of the Southern (Mashona) Hyliota *Hyliota australis* in South Africa? Ornithological Observations Vol 3: 1-17

URL: http://oo.adu.org.za/content.php?id=34

Published online: 16 February 2012, with corrections implemented on 1 June 2012

- ISSN 2219-0341 -

WHAT IS THE STATUS OF THE SOUTHERN (MASHONA) HYLIOTA *HYLIOTA AUSTRALIS* IN SOUTH AFRICA?

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Summary. The status of the Southern (Mashona) Hyliota *Hyliota australis* in South Africa is assessed using newly collated bird and habitat distribution data. The three potential scenarios are discussed, and it is emphasized that all are of considerable interest. (1) If the Hyliota is isolated in the Soutpansberg, it is one of the rarest breeding species in South Africa and needs active conservation management. (2) If it is a vagrant, then the source populations need to be identified as the conventional wisdom suggests movement over much shorter distances than the known populations on the Zimbabwean Plateau and outliers in northern Gonarezhou National Park. (3) A third scenario relying on both periodic breeding and periodic immigration is favoured – suggesting a metapopulation operating across the Save-Limpopo Valley and adjacent plateau areas. The implications for its conservation management are discussed and attention is drawn to the riparian corridors which are under pressure from humans outside conservation areas and from elephants inside them.

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The status of the Southern (Mashona) Hyliota *Hyliota australis* in northern South Africa is a conundrum. It is rarely recorded: Tarboton *et al*. (1987) reported only five records in South Africa to the mid-1980s, all from the Punda Maria area of northern Kruger National Park (KNP), and Tree (1997) showed it only here during the Southern African Bird Atlas Project (SABAP, 1987-1992). Tarboton *et al.* (1987) reported a breeding attempt and concluded it is probably a rare, localised breeding resident restricted to the extreme north of South Africa. But the breeding attempt failed, and Tarboton *et al.* (1987) also suggested it occurs in *Colophospermum mopane* and mixed broad-leaved woodland, and there is no confirmed breeding record of this species in southern Africa in savanna woodland other than miombo. Miombo is the distinctive vegetation in which trees of the genera *Brachystegia*, *Julbernardia* and/or *Isoberlinia* dominate (Wild and Barbosa 1967), and until 2000, it was unknown from South Africa. A patch was discovered in the Soutpansberg (mountains) close to Gundani Village (22°39'S, 30°53'E; Hurter and Van Wyk 2001), where the Hyliota is now known (29 April 2002 (pers.obs.), 24 February 2006 (Joe Grosel *in litt.* 2008)). Gundani is separated from the Miombo Region on the Zimbabwean Plateau by hundreds of kilometres of the Save-Limpopo Valley, which is generally low-lying and too hot and dry for the development of miombo (Figure 1), and is a major barrier to the avifauna generally (Benson *et al.* 1962). To date, the Southern Hyliota is confirmed only as far south as Mutandahwa Hill and Chilo Gorge (just upstream of the Save-Runde confluence) along the northern boundary of Ghonarezhou NP, Zimbabwe (Irwin 1981, Hockey 2005, Darrell Plowes *in litt*. 2009), some 200km from Gundani. Otherwise, it is known from the even more remote miombo in the Panda-Homoine districts of southern Mozambique (see Parker 1999). Although it is known to wander out of miombo at the edge of the Zimbabwean Plateau into (non-miombo) riverine fringes down into the major river valleys during the (non-breeding) cool-dry season, Tree (1997) believed these to be "almost certainly" over short distances. Dowsett-Lemaire and Dowsett (2006), Dowsett *et al.* (2008) and Dowsett (2009) also report "off-season…local wandering" and "limited altitudinal movements" and "(vagrancy) at low altitudes" in the Shire and Luangwa valleys in Malawi and Zambia. Subspecific differentiation either side of the Zambezi Valley supports this interpretation of limited movements: the Zambian Plateau supports *H. a. pallidipectus*, whereas the nominate occurs on the Zimbabwean Plateau (Fry 1997). The Zambezi Escarpment is steep in places so movements from patches of miombo at the edge of the plateau into valley riparian habitats could involve distances of <10km.

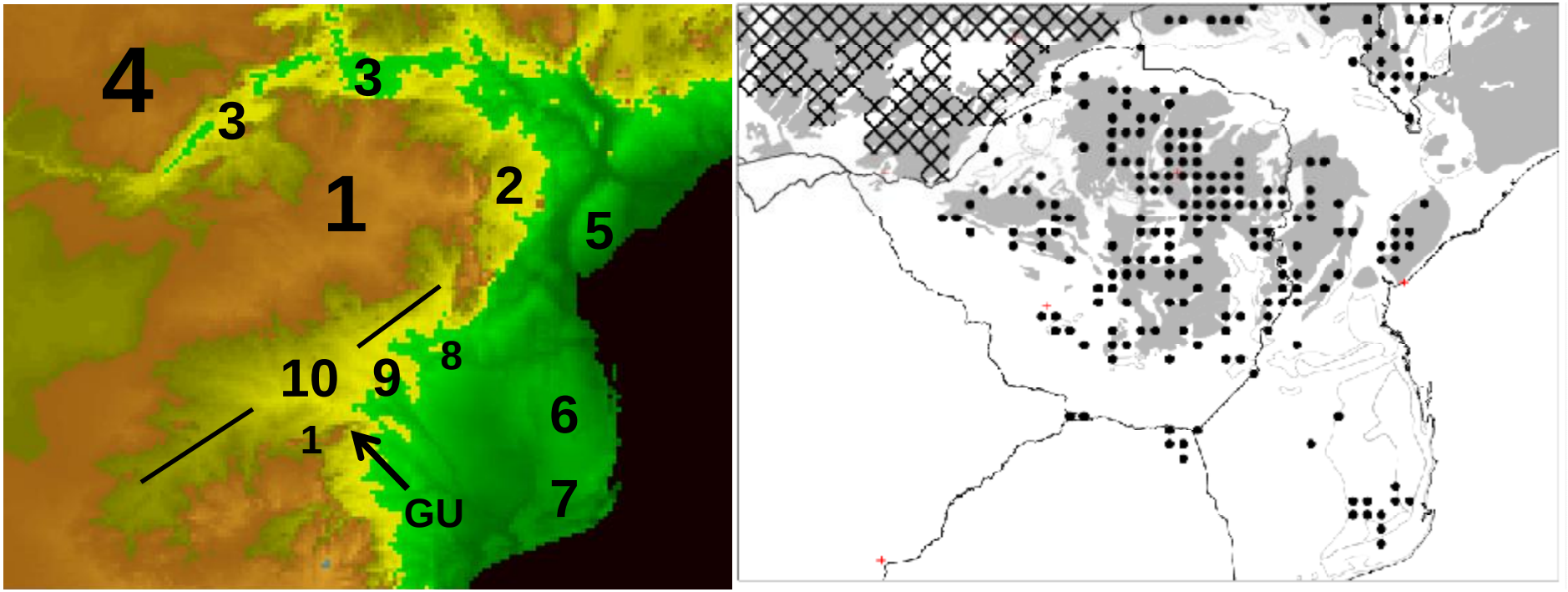


Figure 1 – The location of Gundani (GU) in the Soutpansberg relative to the Miombo Region

Vegetation dominated by the miombo dominant genera (*Brachystegia* and *Julbernardia*) dominates landscapes shaded grey – generally on the plateaus of tropical Africa, but also at lower altitudes where higher rainfall compensates for higher evapotranspiration rates. Not all vegetation dominated by the miombo genera is "woodland": vegetation on the Mozambican coastal plain presents classification problems because much is "forest", "thicket" or "tree savanna" - which are all mapped as open polygons. The distribution of the Southern Hyliota closely follows the distribution of miombo woodland, and is known as far south in the Save-Limpopo Valley as the vicinity of the Save-Runde Junction.

1. Zimbabwean Plateau, 2. Manica Plateau, 3. Middle Zambezi Valley, 4. Zambian Plateau, 5. Cheringoma-Inhaminga Plateau, 6. Raised plains Inhambane province, 7. Dune landscapes Panda and Homoine districts, 8. Save-Runde Junction, 9. Ghonarezhou-Gaza watershed, 10. Save-Limpopo Valley, 11. Soutpansberg

(Vegetation data from Wild and Barbosa (1967) digitised by Rutherford et al. (2005). Hyliota distribution data from Hockey (2005), Dowsett-Lemaire and Dowsett (2006), Dowsett et al. (2008) with additional data listed in Table 1.)

(Although Fry (1997) suggested individuals from the Zimbabwean Kariba Basin are 'overspills from the Zambian population', it is more likely that they are short-distant migrants from the localised stands of *Brachystegia glaucescens* in the Zimbabwean Zambezi Escarpment.) The Save-Limpopo Valley is much wider and generally much drier than the Zambezi Valley (generally limiting woody cover) – and Gundani much more isolated from the Zimbabwean Plateau (Figure 1) - so it is not unreasonable to consider the Southern Hyliota to be resident in northern South Africa, and – given the isolation of Gundani from the Miombo Region – its taxonomic status would warrant closer inspection.

However, the size of the Gundani miombo patch complicates this interpretation of its isolation. Vernon (1985) reported 3 pairs breeding in 100 ha of miombo on the Zimbabwean Plateau, and the Gundani patch is only c. 20 ha (S Venter *in litt.* 2006), suggesting at most only a couple of pairs. This is supported by the observation that the hyliota is rare at Gundani: it was recorded in only 1 of 5 visits (J Grosel *in litt*. 2008). This remains the only known miombo in South Africa (Mucina and Rutherford 2006, S Venter *in litt.* 2006, N Hahn (Soutpansberg Herbarium) *in litt.* 2009), despite the interest generated in its discovery more than a decade ago. The rarity of the Hyliota limits not only its potential to act as the source for all of the records elsewhere in northern South Africa, but even to persist over the long term since very small populations suffer from inbreeding and/or chance environmental and demographic extremes, like drought. *Brachystegia* spp. occurred more widely on the South African Plateau until only 1,000 years BP (Frost 1996), but although the retreat of the Miombo Region is only recent in geological/ climatological time scales, the *status quo* has enough age to suggest the extinction of a tiny, isolated population since then – as could have occurred in other miombo specialists like the Miombo Rockthrush *Monticola angolensis,* which does not occur in what seems like ideal habitat at Gundani. Extinctions of local populations of the Hyliota occur on the Mashonaland Plateau, Zimbabwe, as a result of drought (Tree 1991), emphasizing that its current presence at Gundani is only the result of recolonisation following similar catastrophes and local extinctions at Gundani in the last 1,000 years. Therefore, either there are sources of immigrants – to provide genetic diversity and colonists – elsewhere in northern South Africa, and it is breeding in vegetation not (co-)dominated by the miombo genera (i.e. non-miombo), or the tiny population at Gundani is supported by immigration from outside the Soutpansberg (and South Africa).

Habitat selection by *Hyliota australis*

Habitat selection by *H. australis* across South Africa and the Save-Limpopo Valley of Zimbabwe and adjacent Sul do Save, Mozambique was assessed elsewhere as part of a more general assessment of its habitat selection across southern Africa (Cizek 2011). An enquiry was sent out for all records of *H. australis*, which added significantly to its distribution as shown by Hockey (2005) (Table 1). The distribution of *H. australis* closely follows the distribution of miombo in southern Africa, ending abruptly where its distribution ends (Figure 1; Cizek 2011). There remains no confirmed breeding in South Africa, but while it is not known to breed in vegetation other than miombo in southern Africa – where it holds permanent territories in Zimbabwean plateau miombo (Vernon 1985) – it likely breeds in *Cryptosepalum pseudotaxis* forest in western Zambia (see Dowsett *et al.* 2008), so it is possible breeding occurs in vegetation not (co-)dominated by *Brachystegia* spp. and/or *Julbernardia globiflora* in northern South Africa. Successful breeding in vegetation other than miombo *sensu stricto* would be noteworthy and should be put on record, and definitions of the structural and functional characteristics (e.g. deciduousness) of this vegetation would help define what it is about miombo that sets its apart from other savanna types. For example, there are records of family groups from riverine vegetation even in the period Aug-Nov (Table 1) when it breeds in Zimbabwe (Vernon 1978, Irwin 1981) and the structural characteristics of especially *Acacia tortilis* riverine woodland approach the flat-topped, even-spaced canopy physiognomy typical of much miombo (Cizek 2011). But riverine woodland formations are rare in space and time, and even if it does breed in vegetation other

than miombo *s.s.*, only small numbers are involved – otherwise it would not be so rarely recorded in northern South Africa. Even together with the potentially only tiny local population in the small patch of miombo at Gundani, the maximum total (sub-)population in northern South Africa is only a few handfuls of pairs. That is, *even if it does breed in northern South Africa it would have benefited from immigration from outside South Africa*.

BirdLife South Africa (2011) concluded it is a "vagrant" (see http://www.birdlife.org.za/page/6051/checklists downloaded 7 June 2011), and if it doesn't breed in northern South Africa – and all records are simply wanderers or floaters – then, given the conventional wisdom of only short-distance movements, supported by evidence of subspecific variation either side of the Zambezi Valley, there must be sources of vagrants closer to northern South Africa than the Zimbabwean Plateau and outlier of the Miombo Region in northern Ghonarezhou NP.

Local populations of *H. australis* in patches of miombo in the Save-Limpopo Valley?

The Zimbabwean Save-Limpopo Valley covers a large area (>45,000 km^2) and has been less well-sampled ornithologically than other parts of the country (Hustler in Cunliffe 2000, MPS Irwin *in litt*. 2008), suggesting small outlying populations in between the Zimbabwean Plateau and the Soutpansberg – which could provide immigrants – might have been overlooked. The Hyliota occurs at the edges of its range in *Brachystegia (tamarindoides) glaucescens* and *B. (tamarindoides) torrei*, which (with the closely related *B. (tamarindoides) microphylla*) are unusual in the genus in having naturally highly localised and fragmented distributions because they occupy granite castle kopje and inselberg landscapes which are highly localised (but widespread) across the surrounding plains. Therefore, they are easily overlooked.

B. torrei is of particular interest since it occurs at low altitudes in regions otherwise too hot and dry to support miombo, on elevated ground which intercepts moist south-easterly airflow from the Mozambique coast. To illustrate the importance of moist, south-easterly airflow: while the Miombo Region ends abruptly at the Zambezi Escarpment at the north of the Zimbabwean Plateau, moist air from the south-east allows the Miombo Region to extend to lower altitudes in the south-east of the plateau (Figure 2). Granite geologies also weather in a distinctive fashion, providing bare rock which encourages precipitation run-off which supports more mesic vegetation than in the surrounding plains – like briefly deciduous *B. glaucescens* and *B. torrei* woodland in landscapes dominated by lengithily deciduous open savannas. They also provide refuges from fire which is an important influence on the vegetation physiognomy.

Prior to this study, there was no accurate fine-scale map of the distribution of miombo in southern Africa: broad-scale maps (Campbell 1996, Chidumayo 1997, Desanker *et al.* 1997, Hockey *et al.* 2005) don't show where small patches occur, yet the occurrence of the Hyliota at Gundani emphasizes that small patches are important to understanding the distributions of birds at broad scales. Harrison *et al.* (1997) provide a finer resolution map but it is incomplete. While the "low-altitude ecotype" of *B. glaucescens* has been known for some time (e.g. Wild 1953), it has only recently been given specific status (*B. torrei*, Hoyle and Brummitt 1999) and it is poorly known. Although Coates Palgrave (2002) shows *B. torrei* to be widespread across the Zimbabwean Save-Limpopo Valley, she also mapped at broad scales, and it is likely only present on elevated ground, which is highly localised in the major river valley geologies of south-central Africa. It was decided to search for and collate all available information on the distribution of miombo in the Save-Limpopo Valley, with a focus on the inselberg and castle kopje landscapes.

A search was also made for Hyliota records in northern South Africa and adjacent Zimbabwe and Mozambique. These Hyliota and habitat data are used to assess the status of the Hyliota in northern South Africa, specifically to determine the potential importance of immigration.

METHODS

Southern Hyliota distribution data

Unpublished records sourced from an enquiry and published records from locations not mapped by Harrison *et al.* (1997), Parker (1999, 2005) and Hockey (2005) were converted to the quarter-degree-square system used for the SABAP1 data to supplement them: degree squares were divided into 16 quarter-degree-squares (QDSs) to form a grid c. 25 km x 25 km. Little is known of the distances moved by the canopy insectivores typical of miombo, but 'over-flying' between patches could be limited for many species – usually a 'bird party' (or mixed-species flock) will simply turn around when it reaches the edge of a patch of woodland, for example, along a dambo grassland drainage line. Individuals – but not whole parties – will fly across e.g. fire-breaks (pers.obs.), but it is difficult to assess by sight the upper distances of these flights, since dambo grassland can cover appreciable areas. These distribution data have a coarse resolution – consider that the patch of miombo at Gundani covers only 1/3,000 of a QDS – so are of limited use to assessing the spatial structure of ranges of those species typical of miombo which do not use riverine woodland. But because the Hyliota moves from patches of miombo into riverine woodland – and so can move with greater ease between patches of miombo - coverage by Hyliotas within a QDS must be greater, and it is feasible that there is fairly regular movement between (adjacent) QDSs. Therefore the data are suitable for assessing the spatial structure of the range of the hyliota across the Save-Limpopo Valley.

Miombo distribution data

A search was made for all vegetation surveys across the same region. Searches were also made for relevant specimens in the large collections of the National Botanical Gardens, Harare and Royal Botanical Gardens, Kew. Landscapes where miombo woodland is dominant are coloured green in Figure 2: the Miombo Region is defined where these landscapes occur together. Landscapes in which *Brachystegia* spp. and/or *Julbernardia globiflora* trees are dominant but not in woodland are mapped in grey. Vegetation on the Sul do Save sands presents classification difficulties because formations dominated by the miombo genera are often not "woodland" formations typical of miombo s.s. but (i) denser, and included in e.g. the 'Coastal Forests' of eastern Africa (sensu Burgess and Clarke 2000), or (ii) occur in a 'tree savanna' (sensu Wild and Barbosa 1967) with a thin woody cover.

Small patches away from the Miombo Region are mapped by QDS. Care had to be taken with mapping herbarium specimens because the miombo dominants can occur in even very small patches of only a few individuals – too small to influence the distributions of canopy insectivores – and information regarding the size of the patch from which material was taken is rarely given on the label. Also, as mentioned above, the presence of a miombo dominant does not necessarily mean it occurs in woodland. For example, importantly, *B. glaucescens* is not known to coppice (F Robertson *in litt*. 2009) while *B. torrei* does, which is probably one of the reasons it has been able to invade more level sites away from the rocky slopes of *glaucescens* (Farrell 1968). Rocky sites are more protected from fire, so, although records of the higher altitude *glaucescens* almost invariably refer to canopy woodland favoured by *H. australis*, records of the lower altitude torrei need to be treated with caution since it could occur in coppice regrowth bushed grassland (resulting from regular burning), which is unsuitable for the Hyliota (such as now occurs on the Chihunja Platform in Ghonarezhou NP; F Robertson *in litt.* 2009). *B. torrei* also occurs in forest formations in wetter locales; e.g. Dowsett-Lemaire (2004) reports it as a dominant in dry forest in Mwabvi Reserve, Malawi.

Because *B. torrei* occurs in a range of formations from 'bushed grassland' to 'forest' its occurrence in miombo woodland s.s. has been given careful consideration before mapping in Figure 3. Irwin (1981) reported not only canopy 'Mountain 'Acacia'' but also the Hyliota in the Maliliangwe Hills (c. 350 m). Although a misnomer, its common name recognizes its large spreading crown, and, prior to

the recognition of *B. torrei*, was used for both the high and low altitude 'ecotypes' of *B. glaucescens*. Although the altitudinal limits between *B. glaucescens* and *B. torrei* remain to be determined precisely (and the distributions of the two species are not differentiated in Figure 3), Farrell (1968) mapped an important outlier of the Miombo Region on the Chihunja Platform to be dominated by the 'low altitude ecotype' (= *B. torrei*) at a similar altitude in a QDS adjacent to the Malilangwe Hills. Thus, *B. torrei* woodland s.s. does occur is some parts of the hot, dry Save-Limpopo Valley.

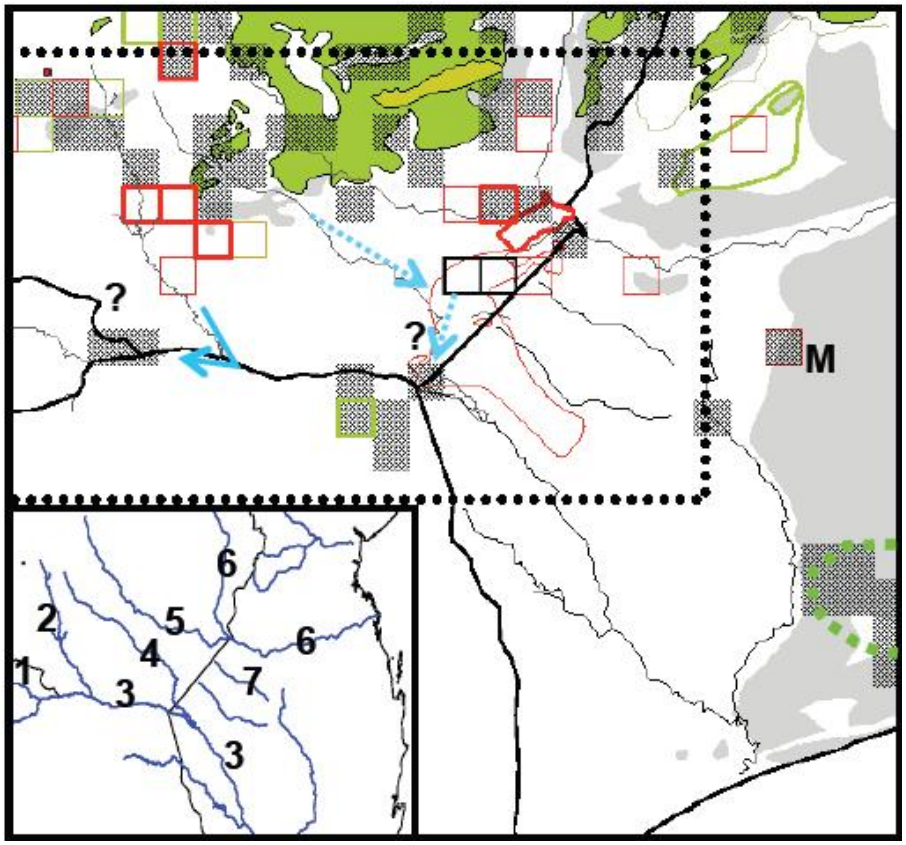
Small patches of miombo in landscapes otherwise dominated by other vegetation are mapped as open QDSs; thin lines represent the presence of *B. torrei* in colonies of an unknown size and physiognomic type, or where patches are too small to support the avifauna, or are not woodland s.s., whereas heavy lines show where a patch/es of canopy miombo is known. Patches of miombo also occur somewhere in the empty polygons (see Wild and Barbosa 1967). For example, importantly, there was a catastrophic decline in canopy *B. torrei* across the Chihunja Platform in the last decades of the last century (Tafangenyasha 1997), but patches still remain (B Clegg unpubl. data). (See Cizek in prep. for more details).

RESULTS

The distribution of miombo and *H. australis* across the Save-Limpopo Valley

The *Brachystegia glaucescens/ B. torrei* complex is important in determining the distribution of *H.australis* at the edges of and away from the Miombo Region (Figure 3). *B. torrei* is especially important because it occurs at lower altitudes than *B. glaucescens*. Most notably, Pinto and Lamm (1955) report an (apparently overlooked) hyliota specimen from Mabote (22°2'S, 34°09'E), where *'B. torrei'* is also known: Kew specimen Barbosa 5081 (30/3/1952) was collected 31,3 km from Mabote (west) on the road to Machaila, presumably from the ridge which intercepts the moist south-easterly airflow. *B. glaucescens* and *B. torrei* usually do not occur in patches large enough to be mapped (as polygons) at broad scales, and the former extensive occurrence of *B. torrei* over much of the Chihunja Platform (Farrell 1968) was exceptional. *B. torrei* is certainly more limited in the Zimbabwean Save-Limpopo Valley than suggested by Coates Palgrave (2002), but extends the distribution of miombo considerably south of the Zimbabwean Plateau, associated with the hills, small platforms, kopje landscapes and steep sandy banks cut by the large rivers draining the plateaus (Figures 2 and 3). The granite kopje landscapes extend as far southwest as the Gwaranyemba Communal Lands (CLs), where unfortunately little vegetation information is available. Slightly southeast, though, canopy *B. glaucescens/B. torrei* covers the kopje landscapes of Bubiana Conservancy (Timberlake and Mapaure 2007), potentially as far south as hill Jopempi (2129D1, R du Toit *in litt.* 2008, J Timberlake *in litt.* 2008) where it is likely the Hyliota has been overlooked.

The topographical features which occur along the southeastern Zimbabwe-Mozambique border (Figures 2 and 3) provide a connection between the Zimbabwean Eastern Highlands (Chipinge Uplands in the south) and the Soutpansberg (Farrell 1968, Cizek in prep.), and this elevated ground supports a number of moister vegetation types atypical of the valley. Although much reduced, canopy *B. torrei* still occurs on the Chihunja Platform (Bruce Clegg unpubl. data), where it is likely the Hyliota has been overlooked (Irwin 1981). There are more patches as far south as the Guluene-Chefu watershed in central Ghonarezhou NP, where there are also unusual patches of canopy *J. globiflora*, supported by groundwater, which cover an appreciable area (>1,000ha; Farrell 1968): it is likely that *H. australis* has been overlooked here too. Intriguingly, Wild and Barbosa (1967) report small patches of *J. globiflora* and *B. torrei* elsewhere (within the area delineated in Figure 2), but no more information was available from specimens or botanists who have worked there (e.g. Stalmans *et al.* 2004; M.Stalmans in litt.). It is likely that these patches are associated with broken ground close to the Mwenezi-Limpopo confluence which includes the steep banks of these rivers and e.g. Monte Gomo, Mozambique (22°29'S, 31°22'E).



Vegetation dominated by miombo tree species dominate landscapes	Vegetation dominated by miombo tree species patchy within landscapes dominated by other vegetation
Woodland (co-) dominated by *Brachystegia spiciformis*	Woodland (co-) dominated by *Brachystegia spiciformis*
Not woodland	*Brachystegia glaucescens*/ *B.torrei* woodland
	Brachystegia glaucescens/ *B.torrei* recorded but size of patch unknown
	Woodland dominated by *Julbernardia globiflora*

Figure 2 – The distribution of miombo and the Southern Hyliota (hatched squares) away from the Miombo Region in the Save-Limpopo Valley and adjacent Sul do Save.
M = Mabote
? = possible location of miombo and/ or the Hyliota
1 Shashe River, 2 Mzingwane River, 3 Limpopo River, 4 Mwenezi River, 5 Runde River, 6 Save River, 7 Chefu River

There is more information on the vegetation of the topographical features a little to the east in Zimbabwe, but Drummond (1958) reports sampling from the western parts of the Mateke Hills and B.torrei would be expected rather in the south-east. Also, during a survey of the Selungwe and Chilomwe hills, Mapaure and Chapano (1999) were prevented from entering the middle and southern sections of Pesu Gorge – which is the most likely locale for B.torrei in these hills. There are more topographical features to the west, but these occur in the rainshadow of the Soutpansberg and *B.torre*i is less likely.

Thus, there are indications that small patches of miombo could occur across this track of high ground, and patches large enough to support the Hyliota can be confirmed as far south as central Ghonarezhou NP, considerably south of the Hyliota's most southerly locale confirmed to date. The occurrence of the Hyliota needs to be confirmed here – which would reduce the distance to the Soutpansberg by almost half.

Unpublished Hyliota records (Table 1) add considerably to the total number of records in northern South Africa, and identify its occurrence in two separate areas: (1) the eastern Soutpansberg and adjacent valley riparian woodlands-forests and (2) riparian habitats close to the Shashe-Limpopo confluence.

DISCUSSION

Assessing movements by *H. australis*

Differentiation between races north and south of the Zambezi River suggests that movements by the Southern Hyliota into the middle Zambezi Valley during the dry season involves vagrancy usually over relatively short distances (Irwin 1981, Tree 1997, Dowsett-Lemaire and Dowsett 2006, Dowsett *et al.* 2008). However, recent unpublished records from riverine woodland at the confluence of the Shashe and Limpopo rivers (Table 1), and the distribution of miombo and orientation of riparian corridors indicates movements over greater distances. Although Harrison *et al.* (1997) mapped outlying patches north of the Tuli Circle (2128D3, 2129C1), the source of this information could not be traced (e.g. J Timberlake pers.comm. 2008) and it is questionable given the aridity of this part of the valley. Therefore, the closest known miombo is in the kopje landscapes in the Bubiana Conservancy (probably south to hill Jopempi), but even if it breeds here, all of the patches occur in the catchment of the Mzingwane River which flows south-eastwards, i.e. away from the Shashe-Limpopo confluence. So either the birds crossed the very hot, dry (<400 mm p.a.) and sparsely vegetated interfluves (cf. Timberlake and Mapaure 1999) which is highly unlikely, or they moved southeast through the thin ribbons of woodland along the Mzingwane River to the confluence with the Limpopo River, then upstream along the Limpopo River to its confluence with the Shashe River: in all a distance of >150 km. It is possible (but less likely) that small patches of *B. torrei*/*B. glaucescens* occur in the kopjes of the Gwaranyemba CLs, but even if the Hyliota occurs, this still requires movements of >100 km (along the Thuli River).

What is the status of the *H. australis* in northern South Africa?

Although not as rare as formerly thought – because greater coverage of the formerly under-sampled Limpopo Province has significantly increased the number of records – it is still rare. There are two distinct areas of its occurrence in northern South Africa which need to be considered independently. Movement from patches outlying the Miombo Region in southern Zimbabwe to the Shashe-Limpopo confluence are highly likely; it is likely a vagrant to extreme north-west South Africa.

The situation in the Soutpansberg is less clear. Prior to the habitat and Hyliota distribution data assembled here, it was likely that the birds in the Soutpansberg were isolated (Scenario 3, Figure 4), a scenario apparently favoured by Tarboton *et al.* (1987) who concluded it is "probably a breeding resident". This would make it one of the rarest breeding species in South Africa, and at high risk of extinction.

Figure 3 – The important topographic features in the Save-Limpopo Valley

A. Matobo Hills, B. Kopje landscapes Gwaranyemba Communal Lands, C. Kopje landscapes Bubiana Conservancy, D. Mt Towla, E. Hills Jopempi, F. Kopjes north of Tuli Circle, G. Shashe-Limpopo confluence, H Kopje landscapes Nuanetsi Ranch, I. Malilangwe Hills, J Chipinge Uplands, K. Hill Mutandahwa, L. Chihunja Platform, M. Save-Runde confluence, N. Gulune-Chefu watershed, O. Mateke Hills, P. Selungwe Hills, Q. Chikwarakwara, R. Monte Gomo, S. Punda Maria, T. Gundani, U. Broken landscapes eastern 'bank' Mwenezi River, V. Mwenezi-Limpopo confluence

Although Barnes (2000) did not include it in a national Red List assessment because it was considered "peripheral" to South Africa, the isolation of small populations at the edge of a species' range rather confers important reasons for its active conservation management. A small founding population – in this case a relict from the shrinking of the Miombo Region due to natural climate change - also has a high potential for diversification. Fry (1997) purposefully drew attention to an outlying population at the north-eastern edge of its range – *H. (australis) usambarae* – by giving it full species status despite slender morphological evidence. The north-eastern South African population might not have been isolated long enough for divergence, but there is potential due to a natural vicariance event – and the active minimisation of losses to anthropogenic causes would be suggested so as not to hinder this divergence.

But the Hyliota and habitat distribution data assembled here suggest at least periodic movements into north-eastern South Africa. Movements into the eastern Soutpansberg might be difficult to determine for certain as even if direct methods are employed – e.g. satellite tagging – movements could be relatively rare, and require long periods of 'observation'. The orientation of the Save River would take wanderers from the Hyliota's known occurrence on the Chihunja Platform through the riparian fringe away from the Soutpansberg. But the patches of *B. torrei* and canopy *J. globiflora* confirmed as far south as the Guluene-Chefu-Mwenezi watershed – and likely occurring even further south – could support a substantial sub-population of even >30 pairs (in the 1 000 ha of canopy woodland mapped by Farrell (1968)) in the drainage of the Mwenezi River. The Mwenezi-Limpopo confluence supports appreciable areas of riverine woodland (e.g. Mapaure and Chapano 1999), in a QDS adjacent to the eastern edge of the Soutpansberg. Individuals could also wander across the track of high ground through the complex mosaic of mesic habitats. That is, whereas the hot, dry valley provides marked limits between patches of miombo and riverine corridors and the surrounding matrix, the track of elevated topographical features supports a more 'leaky' matrix. The Hyliota's confirmed presence in central Gonarezhou NP would make movements to the Soutpansberg highly likely (if only periodic).

That said, it seems unlikely that wanderers or floaters account for all records in north eastern South Africa (Scenario 1). Although rare, it is still regularly recorded and has even been removed from the national rarities list (see http://www.birdlife.co.za/data/files/birdlife_rarities_list_20100514175542.pdf accessed 27 April 2011). Movements of floaters originating in south-eastern Zimbabwe would need to not only reach the Mwenezi-Limpopo confluence, but also then make it into the Soutpansberg with regularity. (This scenario is even less likely if there are no sources of floaters closer than the Zimbabwe Plateau, since movements would then have to occur

regularly over much greater distances than evident from its subspecific differentiation either side of the Middle Zambezi Valley.) *H. australis* is not the only species typical of plateau miombo which will move between and utilize patches of canopy *B. glaucescens* and *B. torrei*. Recently, there have been unconfirmed reports of the Black-eared Seedeater *Serinus mennelli* from the vicinity of Punda Maria (e.g. A Botha in litt. to SA Birdnet 27 Aug 2008). It is not unexpected in northern South Africa given (1) it occurs in *B. glaucescens* and *B. torrei* (Irwin 1981), (2) has been recorded from the track of high ground along the southeastern Zimbabwe-Mozambique border (even further south than the Hyliota, see Hockey *et al.* 2005), (3) is more catholic in its habitat requirements than the Hyliota (occurring in e.g. Zambezi Teak *Baikiaea plurijuga* formations) and (4) undergoes seasonal movements (Irwin 1981). But even though it is more likely to wander over greater distances than the Hyliota, it is still only very rare in north-eastern South Africa. This is additional circumstantial evidence for a source of Hyliotas (i.e. breeding) within the Soutpansberg.

Thus, scenario 2 seems the most likely because although breeding is likely, periodic immigration also seems not only likely, but necessary – to support the very small population. An important conclusion of this scenario – of a metapopulation (*sensu* Hanski 1999) operating across the Save-Limpopo Valley – is that the long-term persistence of the Hyliota in northern South Africa requires not only the maintenance of the outliers of miombo, but also persistence of the riparian corridors (and potentially also the track of mesic habitats along the track of elevated ground). Riparian habitats are under considerable pressure from humans in this generally arid region (Mapaure and Chapano 1999). The status of the extensive areas of canopy *J.globiflora* mapped by Farrell (1968) on the Guluene-Chefu-Mwenezi watershed needs confirmation, especially as they fall inside the national park – and the larger Greater Limpopo Transfrontier Park – and elephants have been implicated in the decline of *B. torrei* in the north of the national park(Tafangenyasha 1997).

Future directions – Implications for the conservation of the *H. australis* (and other miombo specialists)

Although one cannot be conclusive about the status of the Hyliota in the Soutpansberg, all of the scenarios are of considerable interest. Breeding at Gundani and elsewhere in northern South Africa should be searched for (but could be rare), and the spatial scales over which populations of the Southern Hyliota operate in the Save-Limpopo Valley and adjacent plateau areas are worthy of further study. If the birds in the Soutpansberg have been isolated for the last c.1 000 years because of a natural vicariance event, an effort should be made to prevent losses from this tiny population to anthropogenic activities. If, rather, all individuals are wanderers or floaters from southern Zimbabwe, then the sources of these individuals should be identified. If they are from the Zimbabwean Plateau, then they are moving regularly over much greater distances than in the north of the Zimbabwe Plateau and associated Middle Zambezi Valley. Is this because the Middle Zambezi Valley occurs between two core parts of the Miombo Region (the Zambian and Zimbabwean plateaus) and receives more rainfall, so longer distance movements are not necessary? But important characteristics of the nature of its potential distribution in adjacent southeastern Zimbabwe have come to light, and it is hoped readers will visit some of the sites discussed and mapped in Figure 3 to confirm or deny the presence of miombo and/ or the Hyliota.

Some important principles regarding the spatial scales over which populations of the miombo specialists function are beginning to emerge - which need to be explored further as they have important implications for the conservation management of the miombo avifauna. Forests passerines which are rare at broad (even global) scales can be common where they occur; i.e they occur at high densities at local scales. For example, Irwin (1981) estimated 4-6 pairs of Swynnerton's Robin *Swynnertonia swynnertoni* per ha of Chirinda Forest in southeastern Zimbabwe. The conundrum with the Southern Hyliota in northern South Africa is that it is rare not only at broad (regional) scales in the Soutpansberg, but also even in the

patch at Gundani. It seems the conundrum can only be solved if there is immigration; that is, if the spatial scales over which the Hyliota population operates is increased. The Southern Hyliota occurs in the Soutpansberg because unlike many of the other miombo specialists which are absent it will make use of riparian corridors; that is, its populations can function over greater spatial scales. This complicates its conservation management: not only will riverine corridors need to be conserved, but, while a relatively sizeable (sub-)population of Swynnerton's Robins could be conserved by protecting a c. 20 ha patch of medium-altitude evergreen forest (with other suitable habitat characteristics!), conservation of a similar number of pairs of Southern Hyliotas would need to occur over a much greater area than the 20 ha patch of miombo at Gundani. Miombo ecosystem functioning – especially its low nutrient status (Frost 1996), which means bird densities are low (Tarboton 1980) – confers difficulties for the conservation management of the miombo avifauna which are yet to be explored in any depth.

Acknowledgements

I thank Mark Botha, Norbert Hahn, Erik van Wyk and especially Sarah Venter for information regarding the patch of miombo at Gundani; Etienne Marais, Chris Patton, Chris Roche, Pieter van Zyl and the late Ben de Boer for helping to source Hyliota records, and to John Bradshaw and especially Joe Grosel for use of their unpublished records. This study has relied on the great deal of distribution data gathered and centralised by ornithologists, birders and the staff of the Natural History Museum, Bulawayo in Honeyguide, Irwin (1981) and the Southern African Bird Atlas project. I also thank Richard Dean, Warwick Tarboton and Tony Tree for information and discussion of Hyliota records in South Africa, and to Michael Irwin for much stimulating discussion on the miombo avifauna generally and the Hyliota specifically. I thank the staff of the herbarium, National Botanical Gardens, Harare and Gwilym Lewis and Brian Schrire of the Royal Botanical Gardens, Kew for access to collections, and Fay Robertson and Jonathan Timberlake for help sourcing vegetation literature and stimulating discussion. The *Flora Zambesiaca* vegetation data of Wild and Barbosa (1967) were digitised by Rutherford *et al.* (2005) and are housed and distributed by ORNL DAAC, NASA, Oak Ridge, Tennessee.

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Table 1 – Sources of data for presence of Southern Hyliota *H.australis* by QDSs supplementary to Hockey (2005)

Zimbabwe		
Milton (1973)	2029C1	
Brooke (1975)	2129B2	
Irwin (1981)	1530C2, 1629C2, 1727D2, 1828A2/B3/D4, 1830A2, 1832C4, 1932B4, 1930C4, 2030A1 2028B3/B4/D2, 2030C2/D1, 2131B2, 2132A1	Most of the specimen records mapped by Irwin (1981) could be assigned to a QDS with confidence
G.Lowe *et al.* to Tree (1996)	2816B2	
G.Lowe *et al*. to Baker (2004)	2031C4 (Jiri/ Mteri Dam)	5 July 2003
K.Barry *in litt.*	1929D3	
A.Wood *in litt*.	1929B2	
South Africa		
Tarboton *et al.* (1987)	2230D2, 2231C1/C3	Five sightings: c.1982, 19 July 1983, 27-28 October 1983, December1984, mid-December 1985
J.Grosel *in litt.*	(i) 2229A1, (ii) 2230B4, (iii) 2231C1, (iv) 2230D2, (v) 2231A4, (vi)	(i) Single bird in grove of *Xanthocercis zambesiaca* in riparian woodland/ forest along Limpopo River, early August 1990, (ii) three birds in tall, mixed riparian woodland (*Combretum imberbe, Faidherbia albida & X.zambesiaca*) along the Limpopo River close to Madimbo Military Camp, 28 June 1998, (iii) single bird close to Punda Maria rest camp first week June 1987 in *Pseudolachnostylis mapreuneifolia* and *Bridelia* sp.; (iv) a pair in fairly dense, mixed "broad-leafed" woodland including *Kirkia* and *Entandophragma* spp. at Wisani Camp, 22.4.2002; individual in canopy miombo, Gundani, 24 February 2006. (v) three birds in *X.zambesiaca* Pafuri picnic site a few kms from Crooks Corner, 6 November 2005 and 2 December 2005.
J.Bradshaw *in litt.*	2229A2	Three in tall riverine tree at aerial boardwalk, Mapungubwe NP 30 April 2005
AFC pers.obs.	2230D2	An individual in canopy miombo, Gundani, 29 April 2002

Southern Mozambique		
Pinto and Lamm (1955)	2233B2	Most likely inhabiting *B. glaucescens/ torrei* on ridge just to west of Mabote town (22°02'S, 34° 09'E)
Pietersen and Pietersen (2010, *in litt.* 2010)	2233C2	Group of three birds in a bird party in March 2007, in Stalmans and Wishart's (2005) *Guibourtia conjugata - Eragrostis pallens* woodlands

<table>
<tr><td rowspan="6"></td><td rowspan="6"></td><td colspan="4" rowspan="6"></td><td>Is the Hyliota isolated in northern South Africa i.e. is there no movement into northern SA?</td><td></td></tr>
<tr><td colspan="2">(A) For Shashe-Limpopo confluence
NO
Movement from patches outlying Miombo Region (s.Zimbabwe) highly likely

(B) For eastern Soutpansberg -
Difficult to determine, especially as movements could be relatively rare

Circumstantial evidence includes:
Fairly extensive areas of suitable habitat in central Ghonarezhou NP suggest it occurs in Mwenezi R, drainage, making movements to Soutpansberg highly likely (if only periodic).</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>NO</td><td>YES</td></tr>
<tr><td rowspan="2">Does the Hyliota breed in northern South Africa?</td><td rowspan="2">Uncomfirmed but seems likely.

Circumstantial evidence includes: (i) breeding attempts known; (ii) occurrence in seemingly ideal habitat at Gundani suggests it breeds there

Needs to be put on record.</td><td colspan="4">NO</td><td>SCENARIO 1

All individuals are wanderers</td><td>X</td></tr>
<tr><td>YES</td><td>Is breeding confined to miombo?

Possibly not - Given occurrence and attempted breeding in (a) non-miombo moist-dystrophic savanna (Soutpansberg) and (b) riverine formations in breeding season and wet season</td><td>NO

Structural, composition and functional characteristics of vegetation need to be defined

YES

Gundani patch is (breeding) source of ALL records (other than wanderers if occur)</td><td>Rarity of habitat means

Max. total (sub)population of only a few handfuls of pairs</td><td>SCENARIO 2

Very small (sub)population in Soutpansberg periodically supplemented by immigrants and recolonised after periodic extinction events

i.e. Part of a metapopulation operating across the Save-Limpopo Valley and adjacent plateau areas</td><td>SCENARIO 3

One of the rarest breeding species in SA at high risk of extinction.</td></tr>
</table>

Figure 4 – Flow diagram assessing the status of the Southern Hyliota in northern South Africa