Monograph on

Endemism in the Highlands and Escarpments of Angola and Namibia

Angola Cave-Chat *Xenocopsychus ansorgei*
Photo: M Mills

Editors:

John M Mendelsohn
Brian J Huntley
Pedro Vaz Pinto

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The highlands in Angolan conservation areas

P Vaz Pinto[1,2,3], V Russo[3], L Veríssimo[3]

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[1] BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Vairão, Portugal; pedrovazpinto@gmail.com
[2] CIBIO, InBio Centro de Investigação em Biodiversidade e Recursos Genéticos, Universidade do Porto, Vairão, Portugal
[3] Fundação Kissama, Luanda, Angola

ABSTRACT
Angola has an unbalanced assemblage of conservation areas that cover few key ecosystems and, despite expert recommendations and recent efforts to expand the protected area network, the highlands remain poorly represented. This paper lays out the context behind the creation of Angola's protected areas, while exploring some of the existing constraints and attempts to overcome these limitations. Two existing national parks and one partial reserve incorporate some of Angola's highlands, and are briefly described. In addition, some important highland ecosystems proposed for protection are briefly discussed; these highlands are either part of protected areas under current consideration by the Government of the Republic of Angola or are flagged based on biodiversity assessments. In addition to being poorly represented in the protected area network, current inadequate management and limited scientific knowledge of Angola's highlands are highlighted as important components that need to be addressed in order to better conserve these ecosystems.

Keywords: Angola, biodiversity hotspots, escarpment, highlands, protected area network, national parks

INTRODUCTION

The roots of the Angola's protected areas network can be traced back to the mid-1930s when the Portuguese authorities established the first game-hunting reserves in the country. At the time, this decision was framed within the recommendations derived from the 1933 London Convention – *Convention Relative to the Preservation of Fauna and Flora in their Natural State* – encouraging European powers to set aside protected areas in their African colonies (Huntley 2019). During the decades that followed under Angola's colonial rule, several reserves were proclaimed and a total of six were upgraded to 'national parks'. At that time the main rationale behind identifying suitable areas to conserve was the abundance and diversity of large mammals found there and the perceived threats to those populations within regions of little economic development potential, rather than a broader focus to protect different biomes and ecosystems. As a result of this narrow approach, the Angolan protected area network was unbalanced, with critical assemblages of ecosystems, such as Tropical and Subtropical Moist Broadleaf Forests, and Montane Grasslands and Shrublands biomes (see Huntley 2023), seriously underrepresented. This limitation was duly recognised and highlighted, notably by Brian Huntley, the senior ecologist and advisor to Angola's government on protected areas prior to the country's independence and who identified key areas that should be additionally demarcated for conservation (Huntley 1974a, 1974b, 1974c). Due to the Angolan Civil War and resulting civil unrest that followed Angola's independence, little to no progress was achieved on this front until 2010, when a new framework assessment was produced recommending the expansion of the protected area network (Huntley 2010). This culminated in 2011 with the proclamation of three new national parks by the Angolan government. More recently, a further three key areas have been proposed for subsequent demarcation, including two within the Angolan highlands. Table 1 provides a list of Angola's parks.

Throughout this chapter we refer to the highlands *sensu lato* to include the montane regions across the central and southern Marginal Mountain Chain, as well as some inselbergs and the entire escarpment zone. The escarpment can be roughly defined as a broad section of broken, often rugged topography at varying elevations, orientated north–south and separating the lowlands of the coastal plain from the marginal mountain chain and inland plateau. Within the escarpment zone we consider four sections, namely, Cabinda, Northern, Central and Southern (Figure 1). We also briefly discuss the relevance of specific areas in terms of their endemism of plants and/or of terrestrial vertebrates.

PROTECTED AREAS THAT INCLUDE HIGHLANDS

As there is not one clear definition of what formally constitutes a conservation area in Angola, we follow the latest Angolan legislation and policy documents (e.g., Ministério do Ambiente 2018, Russo *et al.* 2022), which recognises within Angola's protected area network nine national parks, one regional park, two integral nature reserves and two partial reserves.

Table 1: *Updated list of Angolan protected areas, including sites currently under consideration by government (October 2023), indicating the year when they were gazetted, area covered, whether they include areas within the boundaries of the highlands and escarpments of Angola (Mendelsohn & Huntley 2023), and a brief mention of main vegetation types represented.*

Protected area Gazetted	**Province**	**Area (km^2)**	**Highlands**	**Main vegetation types**
Bicuar National Park First established as a hunting reserve in 1938, elevated to national park status in 1964; its boundaries were redefined in 1972	Huíla	6,748	No	Miombo woodlands, and woodland–thicket mosaic (mesic)
Cameia National Park Created as a hunting reserve in 1935; established as national park in 1957	Moxico	14,688	No	Floodplains–grasslands, Zambezian savannas and woodlands, wetlands
Cangandala National Park Established as an integral nature reserve in 1963; elevated to national park in 1970	Malanje	637	No	Miombo woodland (humid)
Iona National Park First established as a hunting reserve in 1937; elevated to national park status in 1964 with new boundaries	Namibe	15,190	Yes	Kaokoveld desert, including sand dunes, gravel plains and xeric savannas; montane habitats; and higher elevation grassland–shrubland (sub-desert)
Luengue-Luiana National Park Established as a national park in 2011	Cuando Cubango	47,913*	No	Savanna–woodland (mesic), and wetlands
Mavinga National Park Established as a national park in 2011	Cuando Cubango	42,483*	No	Mixed woodlands and savannas (mesic), wetlands
Mayombe National Park Established as a national park in 2011	Cabinda	2,074	Yes	Humid evergreen and semi-deciduous forests
Mupa National Park Created as a hunting reserve in 1938; established as national park in 1964	Cunene	6,039	No	Mopane woodlands, woodland-thicket mosaic (mesic)
Quiçama National Park Created as a hunting reserve in 1938; reclassified as national park in 1957	Luanda	9,227	No	Arid savanna–thicket mosaic, and wetlands
Chimalavera Regional Nature Park Created as a special reserve in 1971; revised as regional nature park in 1974	Benguela	102	No	Savanna–grassland mosaic (arid)
Búfalo Partial Reserve Established as a partial reserve in 1974	Benguela	405	Yes	Semi-arid savanna, and woodland–thicket mosaic (mesic)
Namibe Partial Reserve Created as a partial reserve in 1959; boundaries revised in 1960 and 1973	Namibe	4,642	No	Grassland–shrubland (sub-desert) and savanna–grassland mosaic (arid)
Ilhéu dos Pássaros Integral Nature Reserve Established as an integral nature reserve in 1973	Luanda	1.5	No	Mangroves
Luando Integral Nature Reserve Established as a hunting reserve in 1938; upgraded to integral nature reserve status in 1957	Malanje, Bié	9,930	No	Miombo woodlands (humid), wetlands
Cumbira Proposed; still under consideration	Cuanza-Sul	n/a	Yes	Humid semi-deciduous forest
Serra do Môco Proposed; still under consideration	Huambo	n/a	Yes	Afromontane grasslands and forests
Pingano Proposed; still under consideration	Uíge	n/a	Yes	Humid semi-deciduous forest

* Area based on new revised boundaries under consideration for re-gazetting.
n/a = not available

Following guidelines set by the International Union for Conservation of Nature (IUCN), national parks constitute the basic legal tool to ensure the conservation of valuable natural landscapes and their biodiversity (Muhumuza & Balkwill 2013). National parks in Angola aim to protect biodiversity while also promoting and benefiting from related services, such as tourism, thereby contributing to socioeconomic development to achieve long-term sustainability. Historically, and in comparison with neighbouring countries, Angola has adopted and maintained a lenient approach in enforcing regulations. For example, human presence and even urban development has been permitted inside national parks, which has recently been worsened by legislation allowing for the industrial exploitation of natural resources in national parks, partial nature reserves and special nature reserves. At least in theory, integral nature reserves enjoy a much stricter mandate, contemplating scientific research as one of its main goals, and not allowing for any exploitation of natural resources. The use of various types of natural resources is permitted in partial reserves, making them more lenient in terms of regulations, while regional parks are intended to be managed at a provincial level, rather than by central government.

For the reasons detailed earlier, Angola's highlands are poorly represented in existing conservation areas. Currently, only two national parks (Iona and Mayombe) and one partial reserve (Búfalo) of Angola's 14 protected areas (Ministério do Ambiente 2018) include small sections of the highlands and escarpments of Angola (Figure 1).

Iona National Park

Situated in the southwest corner of Angola, Iona was the first conservation area to be proclaimed in the country, as a national game park in 1937. Subsequently, it was changed to a game reserve in 1944 and finally upgraded to a national park in 1957. Covering 15,196 km^2 it was, until recently, the largest protected area in the country. Iona National Park (INP) contains a diverse array of desert and semi-arid ecosystems and spectacular landscapes, spanning from a pristine Atlantic coastline under the influence of the cold Benguela Current, to a vast sand sea of massive dunes, extensive gravel plains, tall

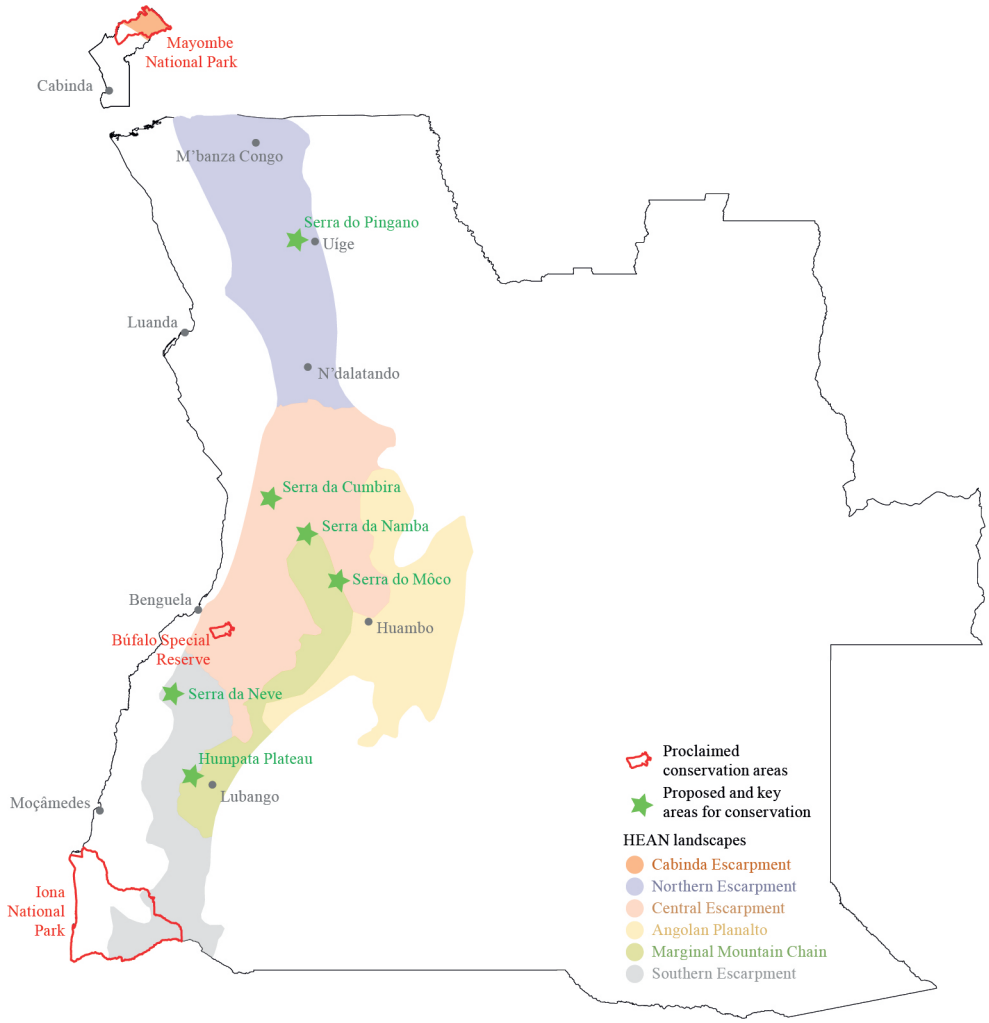

Figure 1: *Proclaimed, proposed and key areas for conservation in the highlands and escarpments of Angola. Landscapes are adapted from Mendelsohn and Huntley's (2023) mapping of the highlands and escarpments of Angola and Namibia (HEAN).*

mountains and dramatic geological formations. The park was formerly famous for its rich biodiversity, ranging from the iconic plant *Welwitschia mirabilis*, large numbers of oryx, mountain and plains zebras and springbok, to the presence of desert-adapted black rhino, elephant and lion (all three species now locally extinct), and the park's very rich coastal marine life.

Although the better-known sections of INP are relatively flat or covered by dunes, the eastern regions are very rugged and mountainous, and include some remarkable highlands. These highlands constitute the southern tip of the Great Escarpment in western Angola, and are represented here by two major orographic features, Serra Tchamalindi and Serra Cafema. Rising just east of Iona village, Serra Tchamalindi consists of a chain of quartzite and dolomitic limestone mountains which stretches about 40 km southwards, reaches 1,944 masl at its highest peak and is surrounded by numerous vertical cliffs of several hundred metres. West of Serra Tchamalindi, Serra Cafema is mainly structured by granites and granodiorites. It is somewhat shorter in length and less steep than Serra Tchamalindi, but has a higher plateau that towers more than 2,000 masl.

Despite constituting some of the most notable highlands in Angola and arguably situated in the best protected and more thoroughly studied conservation area in the country, very little is known about the biodiversity of these mountains because of their remoteness and lack of access routes which have prevented researchers from surveying them. The relatively arid climate on these Iona highlands does not allow for the development of Afromontane forest or moist montane grasslands, yet they may still hold many endemic or restricted-range species, especially plants. Only very recently a biodiversity survey was carried out when a team of scientists was flown to the top of the highlands by helicopter (de Cauwer 2021, de Cauwer *et al*. 2023). Even though the survey was a rapid assessment and most of the data were, at the time of writing this paper, still being analysed, at least two plants previously considered as Namibian endemics, *Sesamothamnus leitneri* and *Commiphora otjihipana*, were found on Tchamalindi and Cafema, respectively, and the rare and vulnerable *Euphorbia leistneri* was recorded for the first time in Angola. In addition, five woody and one succulent taxa may prove to be new species to science (de Cauwer 2021, de Cauwer *et al*. 2023). As a result of this survey, two bird species were also added to the Angolan list, the Cape eagle-owl (*Bubo capensis*) and Layard's warbler *Curruca layardi*, in addition to the Herero chat *Namibornis herero*, a poorly known Kaokoveld endemic. Finally, the herpetofauna found in both these highlands included one of the most spectacular and enigmatic African geckos, the southwestern Angolan endemic *Kolekanos plumicaudus*, and possibly still-undescribed species of *Pachydactylus* and *Trachylepis* (Vaz Pinto *et al*. 2021, Lobón-Rovira *et al*. 2022).

Mayombe National Park

Located in the northern enclave of Cabinda, this is one of the more recently established conservation areas in Angola (proclaimed in December 2011) and covers approximately 2,074 km^2. The creation of Mayombe National Park (MNP) was a late response to protect the unique and highly biodiverse moist rainforest ecosystems present in Cabinda, a priority identified decades earlier (Huntley 1973, 1974a, 2010). The park is part of a transfrontier conservation area (TFCA) proposed to cover most of the Mayombe forest across four countries: Angola, Republic of the Congo, Democratic Republic of the Congo and Gabon. The TFCA encompasses several protected areas, such as national parks, biosphere reserves and marine parks, with a total area of about 36,000 km^2. By integrating MNP into a broader transfrontier initiative it is hoped that it might conserve some of its critical biodiversity components. The park contains a series of mountainous ridges reaching elevations above 900 masl which together with their proximity to the equator and coastline translate into a very moist climate, and lush cloud forests covering the slopes. In contrast to its richness in biodiversity, and because of its remoteness and persistent civil unrest, MNP is also one of the least known national parks. For example, the main publication on the vegetation of the Angolan Mayombe is outdated, focusing on the area from a forestry perspective (Monteiro 1962).

The park is mostly famous for the presence of threatened apes, being the only site in Angola where they occur, namely, the critically endangered western lowland gorilla, *Gorilla gorilla gorilla*, and the chimpanzee, *Pan troglodytes*. These apes are likely threatened by extinction locally due to habitat destruction and poor law enforcement, but viable populations of the critically endangered African forest elephant, *Loxodonta cyclotis*, may still be present in the park. An ongoing study of the mammal communities in MNP, based on a network of trap cameras, has confirmed the presence of both species of apes, forest elephants and a rich diversity of antelopes (Fundação Kissama in prep.).

Although poorly known and probably lacking in strict endemics, the avifauna in MNP is extremely rich and the Angolan Mayombe has been defined as an Important Bird and Biodiversity Area (Dean 2001). Recent ornithological surveys in the park have added 23 new species to Angola's country list (Mills *et al*. in press). Subsequently, pictures of one of the most iconic African birds, the grey-necked rockfowl (*Picathartes oreas*) were retrieved from trap cameras in the rainforest, thus extending the distribution of this threatened passerine southwards into Cabinda

(pers. obs.). Other faunistic groups remain less studied, and the local herpetofauna is virtually unknown even though it may well hold many endemics and undescribed species.

Búfalo Partial Reserve

Covering approximately 405 km^2, the Búfalo Partial Reserve (BPR) was one of the last protected areas to be proclaimed by the Portuguese colonial authorities in April 1974. The main rationale behind the creation of this reserve seems to have been the need to preserve an isolated population of Cape buffalo *Syncerus caffer caffer* which at that time was the most western and isolated population of this subspecies in Angola. The BPR is situated in the first elevational range in western Angola's orographic relief, presenting rugged terrain and a series of hills rising to 1,400 masl. The local climate is semi-arid, and the area is densely covered with spiny savanna and mixed woodlands. This reserve has never benefited from any sort of management, and it has never been surveyed. Its biodiversity is unknown. Given the location, it is likely that the area could have a rich herpetofauna and, pending future investigation, may include several endemics.

HIGHLAND AREAS PROPOSED FOR PROTECTION

Following preliminary and ongoing multidisciplinary studies (Lautenschläger & Neinhuis 2020, Holísticos 2021a, 2021b, 2021c, 2021d), three highland areas have been proposed for protection and are being considered by the government for formal proclamation.

Serra do Môco

Rising abruptly from the surrounding plateau to reach 2,620 masl, Serra do Môco (more commonly known as Morro do Môco) is the highest peak in Angola. It comprises some of the most important montane grassland patches and remnants of Afromontane forest left in the country. In 2009 it was estimated that there were only about 30 Afromontane pockets larger than 0.5 ha in size, totalling just 85 ha left in the whole region (Mills *et al*. 2011, Powell *et al*. 2023). These relict forest patches are found in deep ravines and narrow gorges above 2,000 masl and have high levels of endemism in addition to rare species shared with a few other forest 'islands' scattered across Africa (Huntley & Matos 1992). The need to conserve Serra do Môco had long been recognised, and it was flagged as a priority area to become a reserve even before the country's independence (Huntley 1974a, 1974b, 2010). Although it could not be included as one of the new protected areas created in 2011, a proposal was recently submitted for the demarcation of 138.5 km^2 as the Morro do Môco Partial Nature Reserve, following a public tender and request by the Government of Angola (Holísticos 2021d).

The mountain and its surrounds have been the focus of several biodiversity surveys since the 1950s, at least, and is comparatively better studied than most other Angolan highlands, despite the paucity in botanical data. Nevertheless, recent preliminary vegetation surveys found some of the characteristic floristic elements of these relict Afromontane forests, including *Erythroxylum emarginatum*, *Ficus* spp., *Ilex mitis*, *Newtoni buchananii*, *Pittosporum viridiflorum* and *Podocarpus milanjianus* (Gonçalves 2009, Holísticos 2021b).

In contrast, the avifauna of the massif is relatively well known (e.g., Hall 1960, Mills *et al*. 2011, Mills & Dean 2021) and the area has been identified as an Important Bird and Biodiversity Area as it holds a third of all Angolan endemic species (Dean 2001, Mills & Dean 2021). Of special note, a minimum of c. 75 pairs of the endangered Swierstra's spurfowl *Pternistis swierstrai* may persist at Serra do Môco, making this one of the most important populations worldwide (Mills *et al*. 2011, Mills & Dean 2021). The other endemics are the red-backed mousebird *Colius castanotus*, pale-throated barbet *Gymnobucco vernayi*, Huambo cisticola *Cisticola bailunduensis*, Angola slaty flycatcher *Malaenornis brunneus*, Ludwig's double-collared sunbird *Cinnyris ludovicensis*, Landana firefinch *Lagonosticta landanae* and Angola waxbill *Coccopygia bocagei*. The Môco area may also be important for the preservation of many other montane birds, including rare forms and endemic subspecies (Mills *et al*. 2011, Mills & Dean 2021).

At least four species of endemic reptiles have already been reported from Serra do Môco (Gonçalves *et al*. 2019, Branch *et al*. 2021, Holísticos 2021b). Three of these endemic reptiles have distributions restricted to the Angolan highlands, such as the recently described gecko, *Afroedura wulfhaackei*, the lizard *Agama* cf. *schacki* and the viper *Bitis heraldica*. A fourth species is a mysterious lizard only known from this massif, *Ichnotropis microlepidota*. Even though few studies have focused on amphibians within Môco, the presence of two endemic species has been confirmed recently, namely *Leptopelis anchietae* and *Breviceps ombelanonga* (Holísticos 2021b). In terms of mammals, the region currently holds few large mammals and almost no studies have focused on the most speciose groups such as rodents and bats. The endemic shrew *Crocidura erica* and the mouse *Otomys anchietae* are likely present, and recently another mouse species, *Hylomyscus heinrichorum* was described from a museum series obtained both at Môco and nearby Serra Soque (Carleton *et al*. 2015).

Serra da Cumbira

Serra da Cumbira (sometimes spelled as Kumbira) is the name given to an escarpment ridge situated southwest of the town of Gabela. The ridge is north–south oriented, stretching for about 20 km and reaching just over 1,600 masl at the peak of Engelo. This mountainous ridge holds some of the more extensive remnants of the Central Escarpment forests which can be considered as impoverished outliers of Guineo-Congolian rainforests (Mills 2010). The region of Gabela had been identified as a centre of endemism and underlined as a priority for conservation at least since the 1960s (Hall 1960, Huntley 1974a, 2010, Huntley & Matos 1992, Dean 2001, Cáceres *et al*. 2015). In response, a formal proposal for the creation of Cumbira Partial Nature Reserve, covering 224.5 km^2, was recently submitted to the government (Holísticos 2021c).

A recent botanical survey identified four main vegetation types in Cumbira: moist high forest; submontane forest/woodland; coffee plantations dominated by exotic *Inga*; and agricultural and secondary/disturbed habitats (Gonçalves & Goyder 2016). This short survey found three new Guineo-Congolian species for Angola – *Ficus saussureana*, *Justicia paxiana* and *Tarenna pavettoides*, the latter possibly a new subspecies – and one potentially undescribed species of Rubiaceae within the genus *Rytigynia* (Gonçalves & Goyder 2016).

The area is especially relevant for the conservation of birds, and most biodiversity studies conducted have focused on the ornithological communities (e.g., Mills 2010, 2019, Cáceres *et al*. 2015, 2016, 2017). A total of 227 bird species have been recorded at Cumbira, which holds the highest number of Angola endemics of any site in the country, with 11 endemic species and 20 endemic subspecies (Mills 2019). Significantly, it is also the only site where three of the rarest and most endangered avian endemics are found together, namely the Gabela akalat *Sheppardia gabela*, Gabela bushshrike *Laniarius amboimensis* and Pulitzer's longbill *Macrosphenus pulitzeri* (Mills 2019). Other rare and threatened endemics present include the pale-throated barbet *Gymnobucco vernayi* and Monteiro's bushshrike *Malaconotus monteiri*.

In comparison to the birdlife, mammals have been studied less in the region so far. However, a new and endemic species of nocturnal primate was recently found and described from Cumbira, the Angolan dwarf galago *Galagoides kumbirensis* (Svensson *et al*. 2017), and a poorly known endemic subspecies of the mongoose, Ansorge's cusimanse *Crossarchus ansorgei ansorgei*, was rediscovered in Cumbira which represents the southernmost global record for the forest genus *Crossarchus* (Vaz Pinto *et al*. 2020). Cumbira also holds populations of poorly known primates such as the near-endemic southern talapoin *Miopithecus talapoin*, the endemic subspecies of blue monkey *Cercopithecus mitis mitis*, and the forest nocturnals, Demidoff's bushbaby *Galagoides demidovii* and Central African potto *Perodicticus edwardsi* (Svensson *et al*. 2017, Holísticos 2021a). Due to the lack of herpetological surveys until very recently, only two endemic species of reptiles, *Rhoptropus benguellensis* and *Agama* cf. *schacki*, have so far been recovered from Cumbira, in addition to one amphibian, *Leptopelis jordani*, but definitive identification of these and several other taxa are pending ongoing taxonomic studies.

Serra do Pingano

The need to protect a significant section of the forest biome in northwestern Angola and, more specifically, the mountain ridges of Uíge Province was stressed in the Angolan Protected Area Planning Strategy (Huntley 2010). As a result, a proposal for the creation of protected area to include the Serra do Pingano Forest Ecosystem has been submitted to the Government of Angola and is being considered. Lautenschläger *et al*. (2023) provide a detailed description of the area.

OTHER KEY HIGHLANDS NOT PROTECTED

Several other highlands in Angola are not yet protected by legislation and not included in areas which are currently under consideration to become conservation areas, even though they were prioritised in earlier assessments (e.g., Huntley 1974a, 2010, Huntley & Matos 1992). Here, we briefly discuss three such sites which contain important highland areas in Angola: Humpata Plateau, Serra da Namba and Serra da Neve. There are potentially other important areas, which might be virtually unstudied and have not been mentioned previously or have received much less attention, such as Chongorói, Tchivira Mountain and Serra Mocoti, to name just a few.

Humpata Plateau

The Humpata–Bimbe plateau sits on top of the Chela Escarpment, just west of the town of Lubango in southwestern Angola. The elevation in the area ranges from about 1,900 masl to over 2,300 masl, with its western edges marked by spectacular precipitous cliff faces, and gorges, often more than 1,000 m high, marking the abrupt transition to the coastal plain of Namibe Province, such as at Tundavala or Bimbe. The altitudinal gradient and diversity of ecosystems – Zambezian woodlands, arid savannas, montane grasslands and Afromontane forests – make this area a biogeographic unit of great interest (Huntley 2010). The local vegetation is probably rich in endemism, which can be illustrated by a recently described, new plant species from

Tundavala, *Stomatanthes tundavalaensis* (Hind & Goyder 2014). This site is also recognised as an Important Bird Area (Dean 2001), and among the local avifauna there are at least eight endemic or near-endemic taxa, including the endangered Swierstra's spurfowl *Pternistis swierstrai* and possibly the rarest Angolan endemic, only recently rediscovered in Tundavala, the Angolan white-headed barbet *Lybius leucocephalus leucogaster* (Baptista & Mills 2018, Dean *et al*. 2019). Although the larger mammal populations have long been extirpated from the area, a very short recent survey in Tundavala discovered five unique genetic lineages among rodents, which possibly represent endemic taxa (Krasova *et al*. 2021), and thus suggest a high endemism rate. At least six endemic reptiles occur on the Humpata Plateau, including three geckos and two very rare snakes only recently rediscovered in Tundavala, *Psammophis ansorgii* and *Psammophylax ocellatus* (Baptista *et al*. 2018, Branch *et al*. 2019a, 2019b). Three endemic amphibians are known to occur in the area (Baptista *et al*. 2018), but these include arguably one of the rarest African frogs, the Serra da Chela reed frog *Hyperolius chelaensis*, a montane species only known from two specimens collected in a forest stream down a deep gorge near Bimbe (Conradie *et al*. 2012).

Serra da Namba

Situated in Cuanza-Sul Province, Serra da Namba reaches 2,420 masl at its highest peak; it may well be one of the most important highlands in Angola in terms of biodiversity. The ecosystems of the Serra da Namba share a lot of similarities with those of Serra do Môco, presenting Zambezian woodlands and savanna on the lower slopes, extensive montane grasslands, and Afromontane forest in deep valleys above 2,000 masl. A botanical assessment of Mt Namba, as it is often named, has recently been published (Goyder *et al*. 2023). Although recognised as an Important Bird Area (Dean 2001) and proposed as a potential strict nature reserve for many years (Huntley 1974a, 2010, Huntley & Matos 1992), recent surveys have found that Mt Namba may actually hold, by far, the most extensive and best-preserved remnants of Afromontane forest in Angola (Mills *et al*. 2013), making it the most critical area for the preservation of this highly endangered ecosystem and its associated fauna and flora (Powell *et al*. 2023). An ornithological study confirmed the presence of eight endemic birds at Mt Namba, including the endangered Swierstra's spurfowl *Pternistis swierstrai* and, significantly, two rare montane birds which were only previously known to occur at Môco in Angola but then feared extinct, the bar-tailed trogon *Apaloderma vittatum* and the orange ground-thrush *Zoothera gurneyi*. At least two endemic geckos and one tree frog are known to occur at Serra da Namba, but ongoing studies are expected to lead to the description of new species, some of which might be limited to a highly restricted local range.

Serra da Neve

The intrusive alkaline complex of Serra da Neve constitutes one of the most remarkable inselbergs of southwestern Africa. Situated in the north of Namibe Province, Serra da Neve rises abruptly from the coastal lowlands and resembles, in shape, a huge extinct volcano with a central flat crater at approximately 1,600 masl. It is well framed by cliffs and a mountainous, almost circular ridge consistently above 2,000 masl and reaching 2,489 masl at its highest peak. The inselberg is completely surrounded by acacia savanna and mopane woodlands in the arid coastal plain but contains extensive rich and well-developed Zambezian woodlands dominated by *Brachystegia* spp. and *Julbernardia paniculata*; some escarpment mixed woodlands; savannas dominated by *Cussonia angolensis* and *Peltophorum africanum*; and riverine forest patches with *Ficus* spp. in moister valleys (Barker *et al*. 2015). The local climate appears to be too dry to sustain Afromontane forests, but some elements are present. The montane grasslands at the highest elevations are extensive, while succulent plants are also well represented on Serra da Neve, including the endemic *Euphorbia teixeirae* (Barker *et al*. 2015).

This is arguably one of the most exciting biodiversity hotspots in Angola, fully justifying its inclusion in proposals to extend the protected area network (Huntley 1974a, 2010, Huntley & Matos 1992). Unfortunately, it is also one of the least studied highlands in Angola, and only recently a few biodiversity surveys have been successfully conducted. Almost nothing is known of the local mammal fauna, while it is assumed to have a rich avifauna which includes a combination of rare and endemic birds, including, for example, the grey-striped spurfowl *Pternistis griseostriatus* and the Angolan white-headed barbet *Lybius leucocephalus leucogaster*. Providing more support to consider the site as a regional centre of endemism, recent herpetofauna assessments have already recovered five new species as strict endemics to Serra da Neve: two geckos, *Lygodactylus baptistai* (Marques *et al*. 2020) and *Afroedura praedicta* (Branch *et al*. 2021); one girdled lizard, *Cordylus phonolithos* (Stanley *et al*. 2016); one limbless skink, *Acontias mukwando* (Marques *et al*. 2023); and a toad, *Poyntonophrynus pachnodes* (Ceríaco *et al*. 2018).

THE WAY FORWARD

Angolan highlands include some of the most unique, endemism-rich and highly threatened montane ecosystems in southern Africa, while also supporting some of the highest human densities in Angolan rural areas (Mendelsohn & Gomes 2023). Unfortunately,

these highlands have long been neglected in terms of conservation and the most sensitive areas have not yet been legally protected. The most obvious priority is for the Government of Angola to follow up on previous recommendations and ongoing initiatives to designate as conservation areas some of the already identified sites with critical highlands, such as Serra do Môco, Serra da Cumbira, Serra do Pingano, Humpata Plateau, Serra da Namba and Serra da Neve. Even though designating conservation areas is a necessary step to protect these ecosystems, it does not guarantee that these ecosystems will be successfully conserved. Recent experience in Angola has shown that formally protected areas can be abused as much as community or private lands, since most national parks and reserves have received little or no management and can be considered 'paper parks' – parks that feature in legislation and official maps but are abandoned on the ground. Currently, the government is trying to step-up management practices in some areas and are exploring co-management initiatives in others, which may hold the key for more effective conservation and hopefully can be successfully implemented in Angola's highlands. Furthermore, the regulations around protected areas are, in most cases, inherited from the colonial period and need to be revised and updated to align with up-to-date good practices used elsewhere in southern Africa.

Much of the biodiversity of Angola's highlands is still poorly known, and therefore it is crucial to conduct biodiversity inventories in these areas and report new endemic taxa, especially in cryptic or less-studied groups such as invertebrates, fossorial reptiles, rodents and bats. Finally, our current knowledge of the highlands derives mostly from surveys and expeditions conducted decades ago; there are still large sections of the Angolan escarpment and remote and almost inaccessible mountain peaks and ridges that remain virtually unexplored. Therefore, the identification and surveying of potentially unknown highland hotspots of biodiversity should also be a priority for future work.

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