

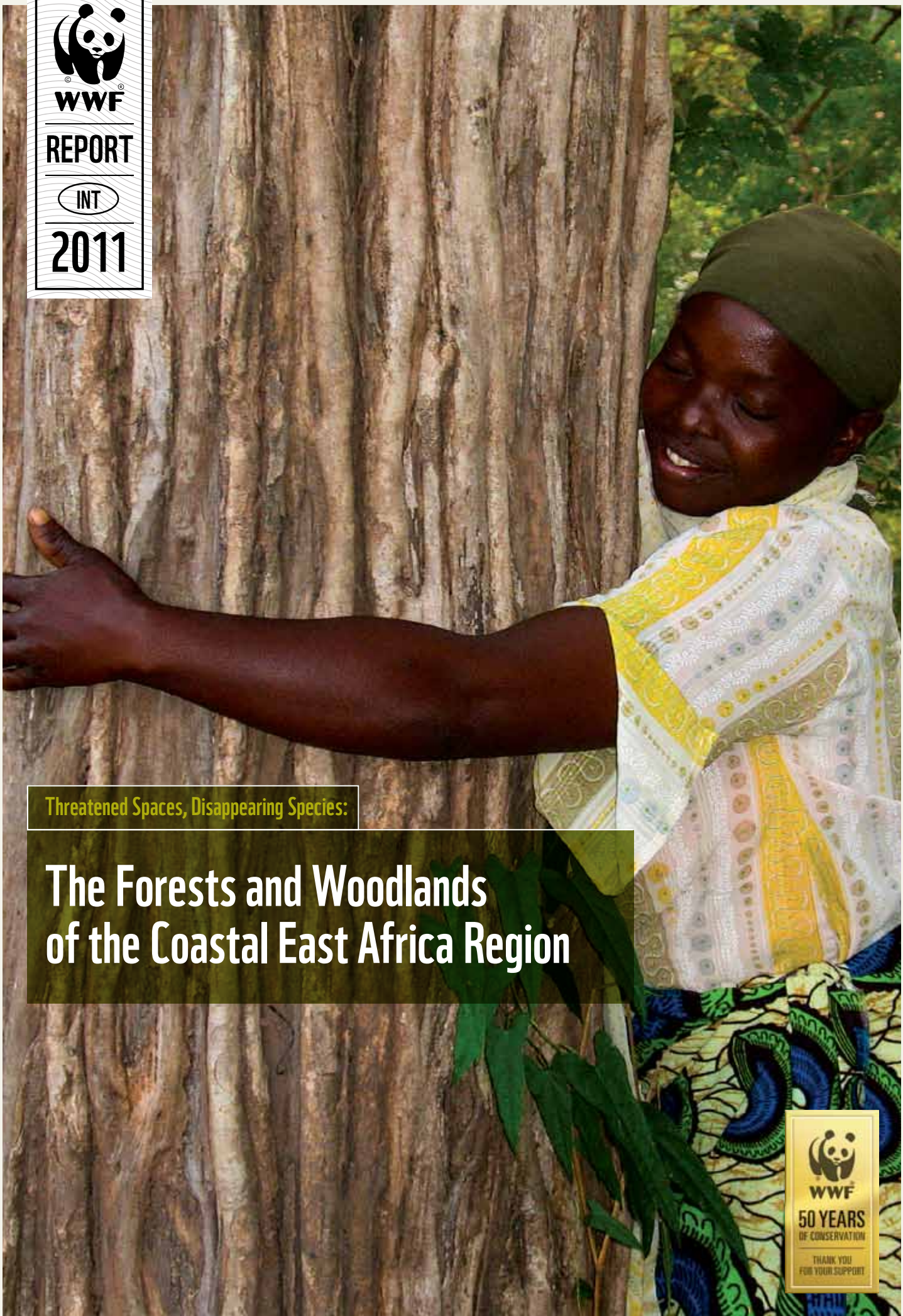


WWF

REPORT

INT

2011



Threatened Spaces, Disappearing Species:

The Forests and Woodlands of the Coastal East Africa Region



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FOREWORD

Eastern Africa's coastal forests and Tanzania's Eastern Arc Mountains are globally recognized by biologists as Centres of Endemism, home to species found nowhere else on Earth. While, for reasons explained in this report, a mere 10% of the original coastal forests of Eastern Africa remain, the surviving fragile patches are a treasure trove of fascinating plants and animals.

However, the forests and woodlands of coastal East Africa, which include the endemic-rich Eastern Arc mountain forests and the vast tracts of Miombo woodland are at increasing risk. Some 20 million people live in the Coastal East Africa region and all of them depend directly or indirectly on these resources for the goods and services they provide. At their current rate of degeneration, however, these benefits will be short-lived and a world that has still so much to be discovered will be lost forever.

The UN General Assembly has declared 2011 as the 'International Year of Forests' to raise awareness on sustainable management, and conservation of all types of forests. Within this context, the publication of this report marks the beginning of a concerted campaign to preserve the vital forest resources of the coastal East Africa region. WWF believes that with government commitment and the support of local communities, we can create a balance between people's need for forest products and services and the survival of Coastal East Africa's unique biodiversity. WWF, through its Coastal East Africa initiative, is committed to ensure the conservation of this important natural heritage.

Peter Scheren

WWF Coastal East Africa Network Initiative Leader

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EXECUTIVE SUMMARY

The African countries bordering the Indian Ocean have an amazing diversity of ecosystems and are rich in biodiversity. Despite this, their human populations are among the poorest on the planet. The region's miombo woodlands, coastal forests, and Eastern Arc mountains harbour tens of thousands of known species of plants and animals, and species new to science are regularly being discovered. While these landscapes are crucially important for the people of the region, as well as for biodiversity, they are under unprecedented pressure as human populations expand and embrace development.

The miombo ecosystems of northern Mozambique and southern Tanzania encompass some of the last great wilderness areas in Africa, home to the continent's greatest populations of savanna elephants and Endangered African wild dogs, as well as to numerous species of antelope, woodland birds, and other vertebrates. Many thousands of species are unique to miombo woodlands and while much of the miombo remains intact within protected areas such as the vast Selous Game Reserve, large areas are threatened by commercial logging for timber species and by clearance for subsistence agriculture, fuelwood and charcoal.

Eastern Africa's coastal forests and Tanzania's Eastern Arc mountains are globally recognized by biologists as **Centres of Endemism**, home to species found nowhere else on Earth. Most of the coastal lowland forests, inhabited by people for thousands of years, have long since been cleared. A mere 10% of the original coastal forest habitat remains and the surviving fragile patches are a treasure trove of fascinating plants and animals, some of them unique to only one or two forest remnants. We are only now starting to make discoveries of species new to science in the coastal forests of Mozambique, which were closed to biologists for decades during that country's civil war. If we lose what is left of this habitat, we will be losing not only a unique ecosystem which provides local people with an array of services, but also its remarkable biodiversity.

Global analyses of biodiversity priority undertaken by conservation biologists show that the Eastern Arc Mountains - a chain of massifs stretching from southern Tanzania and into southern Kenya - rank among the

most important areas of the world for the conservation of endemic birds, plants and other taxonomic groups: they are also home to some of the highest densities of rare and endangered species and genera of flora and fauna in the whole of Eastern Africa, if not the world. Only 30% of the original forest cover of these mountains survives and what is left, mostly in protected areas, is still under threat, along with all its special biodiversity. If the forest cover of these mountains continues to diminish it is not only biodiversity that will suffer: so, too will the people of Tanzania who rely on these mountains for the ecosystem services - especially water and energy - that they provide.

WWF's Coastal East Africa Initiative, together its development and conservation partners, is working to conserve these woodlands and forests and their unique fauna and flora by demonstrating the value of biodiversity, engaging governments and local communities, and reducing human impact through a range of approaches.

WE ARE ONLY NOW STARTING TO MAKE DISCOVERIES OF SPECIES NEW TO SCIENCE IN THE COASTAL FORESTS OF MOZAMBIQUE

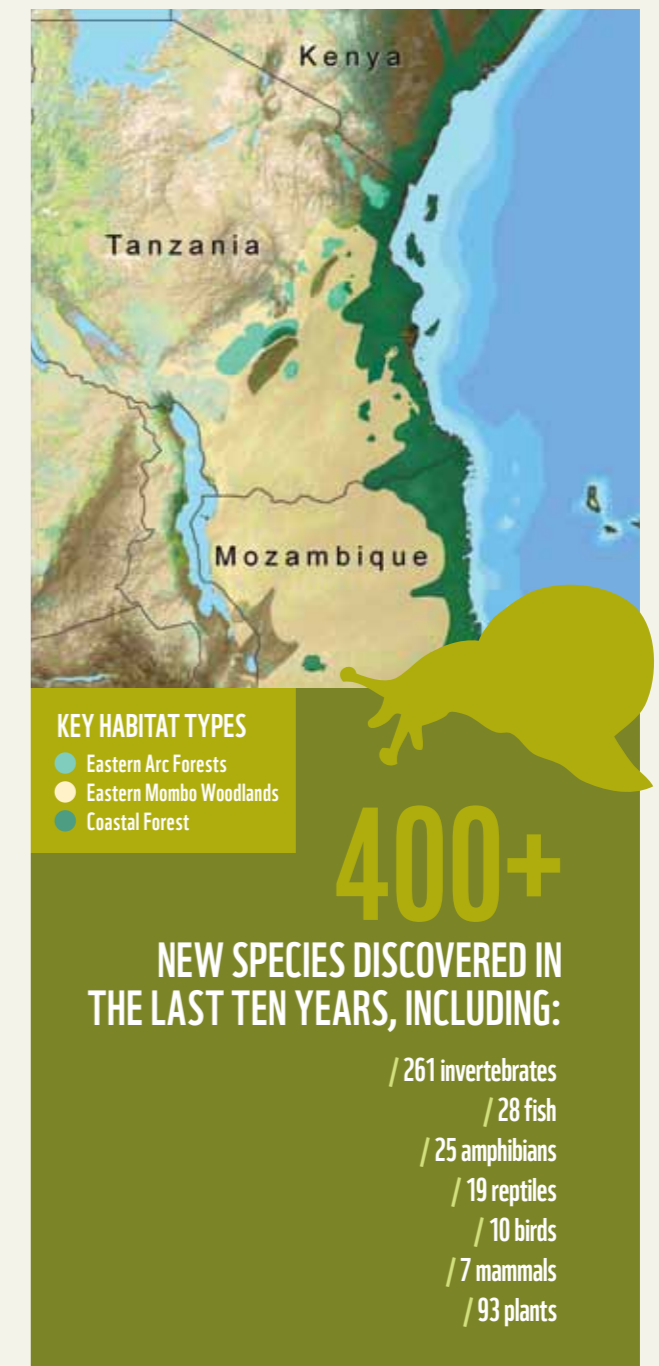
THREATENED SPACES, DISAPPEARING SPECIES: THE FORESTS AND WOODLANDS OF THE COASTAL EAST AFRICA REGION

Where can you find vast swathes of woodland savannas teeming with elephants, tropical rainforests ringing with bird calls, palm-fringed beaches where fiddler crabs chase the waves, and magnificent coral reefs alive with colourful fish - all within a few hundred kilometres of each other? The eastern seaboard of Africa! This amazing corner of the globe is extraordinarily special for its rich tapestry of ecosystems and because its forests and woodlands harbour hundreds of endemic species, found nowhere else on earth. Yet this unique assemblage of plants and animals is under increasing danger of disappearing forever.

WWF's Coastal East Africa Initiative region covers an area of some 1.4 million km² and stretches 4,600 km from northern Mozambique, through southern and eastern Tanzania, and along Kenya's coastline north to the border with Somalia. The region's landscapes - miombo woodlands, coastal forests, Eastern Arc mountains, and inshore waters - harbour tens of thousands of known species of plants and animals. And new species are regularly found: in the last ten years more than 400 new species, including 261 invertebrates, 28 fish, 25 amphibians, 19 reptiles, ten birds, seven mammals and 93 plants have been discovered in the region.

Eastern Africa's woodlands and forests are crucially important for the people of the region, as well as for biodiversity, including many migratory Palearctic bird species. The coastal forests and Tanzania's Eastern Arc mountains are also globally recognized by biologists as *Centres of Endemism*.

EASTERN AFRICA'S WOODLANDS AND FORESTS ARE CRUCIALLY IMPORTANT FOR THE PEOPLE OF THE REGION, AS WELL AS FOR BIODIVERSITY, INCLUDING MANY MIGRATORY PALEARCTIC BIRD SPECIES





© RUDI HAHN

Miombo woodlands in the Selous-Niassa Corridor

AFRICA'S LAST SAVANNA WILDERNESS - THE EASTERN MIOMBO WOODLANDS

Miombo woodlands cover a huge swathe - some 3.8 million km² - of sub-Saharan Africa, stretching from Tanzania and the southern Democratic Republic of Congo in the north to Zimbabwe in the south, and straddling the continent from Angola to Mozambique. In this vast area, soils are nutrient poor and sandy, and the terrain is covered by woodlands where, each year, most of the trees shed their leaves during a dry season that can last up to seven months or more.

The Coastal East Africa Initiative includes the Eastern Miombo Woodlands of southeastern Tanzania and the northern half of Mozambique. These are found at lower elevations than most other miombo woodlands, and closer to the coast they grade into coastal scrub and forest. Several rivers traverse this area in a predominantly west-east direction; these include the Rufiji River in Tanzania and the Ruvuma and Lurio Rivers in northern Mozambique.

Four internationally recognized protected areas are found in the Eastern Miombo ecoregion, of which the vast Selous Game Reserve is the largest. Covering an area of roughly 50,000 km², this World Heritage Site is one of Africa's last true wildernesses, and a core refuge for some 70,000 elephants. In northern Mozambique, nearly 16,000 elephants range across the miombo landscapes of Cabo Delgado and Niassa provinces. Mozambique's 15,000 km² Niassa Game Reserve is separated from the Selous by some 160 km. A long time in the making, a Wildlife Corridor is now in place that provides a vital link between the two protected areas – and wildlife is

protected in collaboration with local people through a network of community-based Wildlife Management Areas. Together, the Selous-Niassa miombo ecosystems and the corridor between them form one of the largest and most significant transboundary ecosystems in Africa, covering over 154,000 km² and containing more than 87,000 elephants, the largest population in Africa.

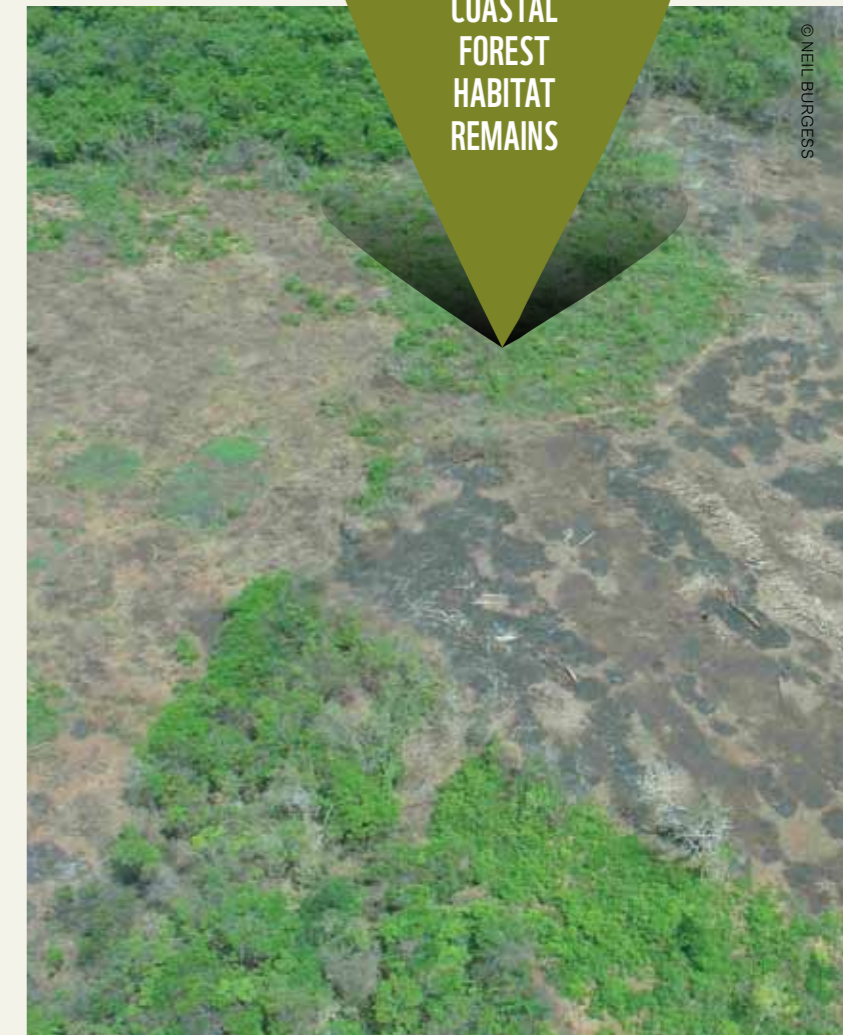
THE REMNANTS OF THESE FRAGILE ECOSYSTEMS ARE A TREASURE TROVE OF SPECIES AND, LIKE THE FORESTS ARC, THE COASTAL FORESTS ARE A CENTRE OF SPECIES ENDEMISM

FRAGILE AND THREATENED - THE COASTAL FORESTS

The lowland regions of coastal eastern Africa were once covered by a forest mosaic extending from southern Mozambique north to the Kenya's border with Somalia. These forests were a diverse mix of forest and woodland types that made up part of the so-called 'Zanzibar-Inhambane Forest Mosaic'. However, the coastal lowlands have been inhabited by people for thousands of years and the past century has seen a population explosion and a huge increase in development. Most of the coastal forest has long since been cleared for agricultural land, or felled for timber, fuelwood and charcoal (which is exported to urban centres, often across borders), and human pressure on the remaining forest areas is enormous. The remnants of these fragile ecosystems are a treasure trove of species and, like the forests of the Eastern Arc, the coastal forests are a centre of species endemism.

A mere 10% of the original coastal forest habitat remains, fragmented into some 400 patches covering around 6,250 km²: 787 km² in Kenya, 692 km² in Tanzania, and at least 4,778 km² in Mozambique. The largest patch in Kenya is the Arabuko-Sokoke forest with an area of 416 km² but most of the other forest fragments in Kenya and Tanzania are considerably smaller, with only 19 being more than 30 km². In Mozambique, however, there are vast areas of coastal forest mosaic habitats, and most remain largely unexplored in terms of biodiversity. Only about 17% of these highly threatened forest fragments are protected in some way, most of them as government-managed Forest Reserves. A very few areas have the highest level of protection – the largest of which are Kenya's Shimba Hills National Reserve, parts of Tanzania's Sadaani National Park and the eastern margins of the Selous Game Reserve, and coastal areas of Mozambique's Quirimbas National Park. A few tiny forest fragments in southern Kenya, regarded as sacred by local people are also partly protected.

The coastal forests are important not only for their biodiversity but also because of their many and varied uses to local people as sources of medicinal plants, fuel wood, building materials, and food. They also



provide other ecosystem services such as reducing soil erosion, maintaining ecological cycles, and carbon sequestration. Many of them have important cultural values as 'sacred groves': the Kaya forests of Kenya's Kwale and Kilifi Districts were once important strongholds against raiders, but now house the graves of local elders. Sacred forests are also common in Tanzania and Mozambique, where extractive use is closely regulated by communities.

TREASURE “ISLANDS” - THE EASTERN ARC MOUNTAINS

The so-called ‘Eastern Arc’ is a chain of some 13 ancient, isolated mountains, stretching from south central to north eastern Tanzania and into southern Kenya. These massifs, the highest rising to over 2600 metres, present a barrier to the moisture-laden monsoon winds blowing from the Indian Ocean which results in high rainfall and moisture dripping from clouds blowing through the trees, especially on the east and south-east facing slopes.

The wetter flanks of these mountains were historically swathed with mighty rainforest trees, with slightly drier forest types and grasslands cloaking the summits and western slopes. Now only 30% of the original forest survives, with the greatest area of forests remaining on the Udzungwa, East Usambara and Uluguru mountains, mostly within Forest Reserves, Nature Reserves and a National Park. Elsewhere, the forests have been felled for subsistence farms and commercial agriculture.

The Eastern Arc mountains have an amazing assemblage of biodiversity, many endemic species and some of the rarest and most threatened species on the planet. Global analyses of biodiversity priority undertaken by conservation biologists show that the Eastern Arc Mountains rank among the most important areas of the world for the conservation of endemic birds, plants and other taxonomic groups: they are also home to some of the highest densities of rare and endangered species and genera of flora and fauna in the whole of Eastern Africa, if not the world, with some 1,000 threatened plant taxa and 95 threatened vertebrate species.

These mountains and their remaining forests are also crucially important for Tanzania’s economy: they form the catchment areas for many major rivers which supply water for agriculture, industry, and urban centres, including the capital, Dar es Salaam. Some 25% of Tanzanians rely on these mountains for their water supply, and hydroelectric dams using water from the Eastern Arc contribute more than half of Tanzania’s electricity. The mountains’ fertile soils and high rainfall also allow for commercial farming of coffee and tea, as well as smaller-scale farming of fruits and vegetables that can not be grown at lower altitudes. Sugar plantations at the base of the mountains rely on water from the highlands. The total economic value of the natural resources (agricultural crops, timber, water) supplied by the Eastern Arc has been estimated at some \$620 million. However, human population pressure is such that many of the remaining forests, even those within Reserves, are being degraded as land is cleared for small-scale agriculture and trees felled for fuelwood. Fires – usually started by farmers - are also a problem during the dry season.

25%
OF TANZANIANS
RELY ON THESE
MOUNTAINS
FOR THEIR
WATER SUPPLY

Forests, biodiversity and human well-being

With the largest intact woodland savanna wilderness remaining in Africa and some of the most biodiverse forests on earth, the eastern African coastal region’s natural riches are unparalleled. Despite this, the area is situated within some of the world’s poorest countries.

Species, the building blocks of biodiversity, provide uncounted benefits for the region’s 20 million people in the form of ecosystem services such as watershed protection, food, timber, medicines, and income from tourism. The cost to human well-being of losing species is thus almost incalculable.



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The Coastal East Africa Initiative is inspired by a simple vision:

of nature and humanity co-existing for the benefit of one another; of protecting the region’s extraordinarily rich and bountiful biodiversity and the opportunity this can offer to the people who share this vast territory to escape poverty and, through the sustainable use of their natural wealth, to create better and more prosperous lives for themselves and their children.

ENDEMIC SPECIES, CENTRES OF ENDEMISM, AND CONSERVATION

An **endemic species** is one found only in a given location and nowhere else in the world. It may be unique to a small area (for example, the Kihansi spray toad, native to just a few hectares in the Eastern Arc mountains) or to a geographical region (for example, Fischer's turaco, a brightly-coloured bird endemic to eastern Africa's coastal forests). Other species may be 'near endemics'; these are largely limited to one site or region but known to occur in one or a small number of other locations.

Some endemic species – sometimes called 'new endemics' - have evolved in the place where they are found: because of natural barriers they have never been able to disperse more widely. Isolated habitats such as large lakes or oceanic islands tend to have large numbers of such endemics. Other endemics may be surviving populations of ancient species which were once much more widespread: DNA analysis of these so-called 'old endemics' shows that they may be closely related to species in places distant (sometimes on another continent!) from their present range.

167
ENDEMIC
AND NEAR-ENDEMIC
VERTEBRATE
SPECIES FOUND
THE EASTERN ARC
MOUNTAINS

THE EASTERN ARC MOUNTAINS AND EASTERN AFRICA COASTAL FORESTS CENTRES OF ENDEMISM APPEAR TO HOST BOTH 'OLD' AND 'NEW' ENDEMIC.

Centres of Endemism are special places that harbour many endemic species. The Eastern Arc mountains and eastern Africa coastal forests Centres of Endemism appear to host both 'old' and 'new' endemics. They are islands in time and space: cauldrons of evolution allowing new species to form, and stable habitats, or refugia, allowing old species to survive the great fluctuations in climate that the rest of Africa has undergone through the millennia.

Endemic species make a huge contribution to the total diversity of life on earth. However, they are more at risk of extinction than widely distributed species: their limited range and usually small populations make them very vulnerable to alteration of their habitat, whether by human activities or by chance 'natural' events such as prolonged drought, hurricanes, or disease. Thus they tend to be of conservation concern and many are listed as Endangered or Critically Endangered in the Red List of Threatened Species. Of the 167 endemic and near-endemic vertebrate species found the Eastern Arc mountains, 71 (42%) are threatened by extinction.



© VIOLA CLAUSNITZER

The dragonfly *Coryphagrion grandis*, endemic to the Eastern Arc mountains, is an ancient insect: a relict of the time when Africa was joined, some 200 million years ago, with other continents in the colossal Gondwana landmass. Its closest relatives today are found in Central and South America.

SPECIES OF THE EASTERN MIOMBO WOODLANDS

Typical miombo woodlands are dominated by three genera of trees – *Brachystegia*, *Julbernardia*, and *Isoberlina* – belonging to the legume (pea) subfamily *Caesalpinioideae*: ‘miombo’ means the *Brachystegia* tree in the local languages.

The habitat is, however, far from uniform: rivers and dambos (seasonally waterlogged depressions) bordered by *Borassus* and *Doum* palms; grassy floodplains; areas of richer soils with *Acacia* and *Terminalia spinosa* thickets; and rocky outcrops or inselbergs provide a mosaic of habitats. More than 8,500 species of vascular plants are estimated to occur in miombo woodlands, of which perhaps more than half are found only within this vegetation type. This gives miombo a wealth of plants as great as in some lowland rainforests.

More than 2,000 plant species have been recorded in the Selous, as well as 440 bird species. Typical birds of the miombo include the miombo grey tit, miombo double-collared sunbird, and miombo bearded scrub robin. Tanzania is home to more bird species than any other African country and of its 1,300 bird species, some 40-50 are miombo specialists. Several globally

threatened bird species are also known to occur in the area, including wattled crane, and the migratory corncrake and lesser kestrel.

Although densities of ungulates are lower than in grassland savannas, a great variety of hooved mammals inhabit the Eastern Miombo, including large numbers of buffalo, wildebeest, Roosevelt’s sable antelope and Lichtenstein’s hartebeest, as well as a number of smaller antelopes. Hippos and Nile crocodile are abundant, while a small population of black rhino, devastated by poaching in the 1980s, clings on to survival in the Selous. As noted in the introduction, the Selous Game Reserve still boasts one of the highest concentrations of elephants in Africa. Predators include lion, cheetah, leopard and hyaena, and the Eastern Miombo supports possibly the biggest population of endangered African wild dogs on the continent.



© SUE MAINKA / IUCN

Once widespread throughout sub-Saharan Africa, fewer than 5,500 Endangered African wild dog are thought to survive. The Selous Game Reserve and adjacent Mikumi National Park may harbour the largest remaining populations.

© PETER HOWARD



Elephants (*Loxodonta africana*) in the Selous Game Reserve

© WARWICK TARBOTON



Miombo double-collared sunbird

© DAVID TANNER / WWF-UK



A subspecies of the widespread sable antelope, this magnificent animal is found in a few areas of coastal woodlands in Kenya and Tanzania but its stronghold is in the Selous Game Reserve.

Miombo has a unique assemblage of plant and animal species, and many of them are referred to as ‘miombo endemics’ – meaning that they are not found in other types of woodland (although they may be found over a wide area). Twenty-five amphibians (toads, frogs and tree-frogs), 18 birds, seven mammals and 70 reptile species are classified as strict miombo endemics. Miombo has a rich diversity of reptiles and this is the only vertebrate group in the eastern miombo woodlands with a significant level of endemism. However, the smaller vertebrates and invertebrates of the Eastern Miombo remain very poorly known.

Of the thousands of plant species restricted to miombo woodlands of eastern, central and southern Africa, some 334 are trees. An astonishing variety of fungi, many of them edible and relished by local people, push up from around the trees during the rainy season: the roots of miombo trees rely on these fungi to derive nutrients from the poor soils where they grow.



SPECIES THAT ARE CLASSIFIED AS STRICT MIOMBO ENDEMICS

- / 25 amphibians (toads, frogs and tree-frogs)
- / 18 birds,
- / 7 mammals
- / 70 reptile



© QUENTIN LUKE

Tana River Euphorbia (*Euphorbia Tanaensis*)

ENDEMIC SPECIES OF THE COASTAL FORESTS

Eastern Africa's threatened and fragmented coastal forests are home to some 1,750 endemic plant species and 33 endemic plant genera. Eleven species of wild coffee are found here, of which eight are endemic. There is a huge difference between the flora (and fauna, especially less mobile species like millipedes) of different forest patches – for example, forests that are only 100 km apart can differ in 80% of their plants and more than a third of the endemic plants appear restricted to just one or two small forest areas. This begs three questions: how much more widely distributed might these species have been in the past? How many have vanished forever as the coastal forests have been destroyed? And, how many will soon become extinct, unless given strict protection?

Two areas – the forests on the south Kenya Coast and in the Lindi District of southern Tanzania have particularly high concentrations of endemics. New plants are still being discovered in the coastal forests: a recent expedition to the poorly-known but extensive coastal forests of northern Mozambique found about 20 new plant species and a new genus. It is likely that most of these will prove to be endemics.

Although charismatic megafauna like elephant, leopard and lion are found in some of the coastal forests, the 'endemic flagships' of this ecosystem have to be the primates. The endangered Tana River mangabey and the Tana River red colobus are both restricted to small patches of gallery forests in Kenya's Tana River region, while the Zanzibar red colobus – another endemic – has an estimated population of 1,000-1,500 individuals, mainly living in and around the Zanzibar's Jozani Forest. Of the prosimian primates, several nocturnal galagos (or bushabies) are endemics with restricted

ranges: the Zanzibar galago is found on Zanzibar and in northern coastal Tanzania; the Rondo galago is found in the southern Tanzanian forests, Grant's galago in the northern Mozambique forests and the Diani small galago ranges from northernmost Tanzania into the Kenyan coastal forests. These nocturnal animals are representatives of an ancient group of primates, which seems to have its centre of diversity in the forests of eastern Africa.

Amongst the vertebrates in these forests, seven percent of mammals, 10 percent of birds, 57 percent of reptiles, and 36 percent of amphibians are endemic; a total of at least 80 endemic vertebrate species. More than 96 species of lizards, geckos, skinks, snakes and other reptiles live in the coastal forests, of which 53 are endemic. Hundreds of invertebrates are thought to be unique to these forests – of the taxa so far investigated, coastal forest butterflies, millipedes and snails all have high levels of endemism.

© STEFFEN FOERSTER



Sokoke Scops Owl

More than 200 species of forest birds have been recorded in the coastal forests of Kenya and Tanzania, of which eleven species and eight sub-species are found nowhere else. A further eight endemic bird species are shared with the Eastern Arc mountains. The Sokoke scops owl is found mainly in Kenya's Arabuko-Sokoke forest, with a smaller population in the nearby East Usambara Mountains of Tanzania. Recently, a few have been observed in a forest remnant north of Arabuko-Sokoke suggesting that it might be wider spread than previously believed. This tiny owl is listed as Endangered because it has a very small, severely fragmented range, and the large trees which are probably its main source of nest cavities are being felled for timber and firewood.

© GALEN RATHBUN / CALIFORNIA ACADEMY OF SCIENCES



Golden Rumped Sengi

East Africa's coastal forests are the most important areas in the world for elephant shrews or 'sengis' - charming little insectivorous mammals which are widely distributed across Africa. But three of the four known species of giant elephant shrews – about the size of a small cat - are known only from the forests of Coastal East Africa. Scurrying noisily along well-used runs on the forest floor they unearth insects and earthworms from the leaf litter with their paws and long flexible nose. The Endangered golden-rumped sengi is confined to two small patches of coastal forest in Kenya. Another elephant shrew, the black and rufous sengi (*R. petersi*) inhabits both the Eastern Arc and coastal forests.

© EVAN BOWEN JONES



Pemba Flying Fox

Pemba, a small, densely inhabited island north of Zanzibar, was once covered by coastal forest. Only small patches remain and most of the island is given over to small scale farming and cash crops such as cloves. Pemba has its own suite of endemics, including four bird species. The Pemba flying fox is Africa's largest fruit bat with a wingspan of 1.7 metres, rufous fur, and black face and wings. It roosts in trees in large colonies and feeds on flowers, leaves and fruits such as mango and figs. Hunted by islanders, as recently as 1989 only a few hundred of these bats survived and they were classified as Critically Endangered. Following a successful conservation awareness campaign and efforts to preserve Pemba's remaining forests the population has soared to more than 22,000.

© TOM STRUHSAKER



Ader's Duiker

Zanzibar's small forests may be home to the last populations of the Critically Endangered Ader's duiker, Africa's most threatened antelope. Its numbers have plummeted over the past two decades. This tiny antelope is thought to have once ranged widely in the East African coastal forests, but populations in the Arabuko-Sokoke seem to have declined dramatically, and a newly discovered population in Dodori Forests remains poorly known. It is threatened by hunting and habitat destruction.

© PHIL CLARKE



New Baphia species

Baphia is a small genus of shrubs, lianas and trees of Africa, Madagascar and the Old World Tropics. This newly discovered species from Mozambique was common in coastal forest patches that showed little sign of past human disturbance, but was entirely absent from the large areas of forest that had regenerated in Cabo Delgado province due to depopulation of rural areas as people fled from post independence civil wars that lasted until 1992.

ENDEMIC SPECIES OF THE EASTERN ARC MOUNTAINS

Although the forested areas are now fragmented, the Eastern Arc is truly remarkable for its great number of endemic species – perhaps one of the greatest concentrations of endemics in the world. Most of the endemics are forest specialists and include both ‘old’ and ‘new’ endemics. Some of those with ancient origins show affinities with species found in West Africa, Madagascar and as far away as Southeast Asia and Central America.

Eastern Arc forests have probably endured largely unchanged for more than 30 million years while other parts of Africa underwent fluctuations in climate. Some of the special organisms found here are ancient relicts from the time when a continuous swathe of forest was present across the whole of tropical Africa, while others have evolved comparatively recently in their isolated mountain habitats. The Eastern Arc massifs and their forests are thus rather like islands in both time and space – in fact they have been dubbed ‘The Galapagos of Africa’.

At least 118 vertebrate species (12 mammal, 19 bird, 32 reptile and 50 amphibian species) are endemic to the Eastern Arc including four endemic or nearly endemic species of primate – Sanje mangabey, Udzungwa red colobus, mountain galago, and the newly discovered kipunji. Among the endemic mammals is the recently discovered grey-faced sengi, or giant elephant-shrew. A further 71 vertebrate species are near-endemic (also being found in one or two other locations).

The invertebrate fauna is also exceptionally rich in endemic species, although it remains poorly known. Information on spiders and millipedes indicate that up to 80% of invertebrate species (and many genera) may be strictly endemic to a single mountain. The number of endemics found in any one mountain block is closely tied with the area of remaining forest. These patterns seem to be repeated across other invertebrate groups, including butterflies. There are 78 butterfly species are either endemic (43) or near-endemic (35) to the Eastern Arc. Among the dragonflies are two species strictly endemic to the East Usambaras.

Seventy-one of the endemic or near-endemic vertebrates are threatened by extinction (eight listed as Critical, 27 as Endangered, 36 as Vulnerable), with an additional seven wide-ranging threatened species. Hundreds of plant species are also threatened and some, like the endemic tree *Platypterocarpus tanganyikensis* may already have disappeared.

Udzungwa Forest Partridge

This little game bird has genetic affinities with primitive Asiatic forest partridges and is believed to be a relic of the time in the early Miocene (about 25 million years ago) when Africa was joined with Asia. It is listed as Endangered because it is known from only three locations within a very small range, in which it is at risk from hunting and habitat destruction and degradation. Despite intensive surveys, it has been found only in parts of the Udzungwa highlands and in the northern Rubeho Mountains, 150 km to the north of the Udzungwas. The northern population has recently been assigned to a different species. These partridges forage in family groups in the leaf-litter on the forest floor, on invertebrates such as beetles and seeds, and roost in trees four to eight metres above the ground.



© LOUIS HANSEN



© TIMOTHY HERMAN / TOLEDO ZOOLOGICAL SOCIETY

UP TO **80%**
OF INVERTEBRATE
SPECIES (AND MANY
GENERA) MAY BE
STRICTLY ENDEMIC TO
A SINGLE MOUNTAIN

Kihansi Spray Toad

The Eastern Arc Mountains are home to the amphibian genus *Nectophrynoides*, which includes most of the world’s viviparous (live-bearing) toads. When it was discovered in 1999, the little Kihansi spray toad (*N. asperginis*) occupied a two-hectare area in the spray zone of the Kihansi Falls in the Udzungwa Mountains. At that time, some 17,000 individuals were crowded under this perpetual shower of water. However, after a peak of almost 21,000 animals in 2003, the population quickly went into steep decline: in 2004, only three individuals were found. Since then, despite extensive surveys, no toads have been seen and it is now listed as ‘Extinct in the Wild’ by IUCN’s Red List. Fortunately, there is a small population of Kihansi spray toads in captivity in the USA.

The extinction of this fragile endemic amphibian is likely to have been due to the construction of a dam upstream from the Falls, causing a huge reduction in the volume of spray, or pollutants in the river, or a fungal disease, chytridiomycosis, which is affecting amphibian populations worldwide. Or perhaps it was a combination of all three.



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The Golden Dancing Jewel

The Golden Dancing Jewel is found along clear and fast running streams and rivers in the Eastern Arc Mountains. It owes its name to its colour and to the dancing mating flight that males perform if a female is present. The inflated and coloured legs are used to attract females and frighten other males. Currently the species is considered as Vulnerable on the global Red List. text credit: Viola Clausnitzer



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‘New’ Amphibians

‘New’ amphibians are regularly being discovered throughout the Eastern Arc. This toad, in the *Nectophrynoides* genus, is endemic to the Rubeho mountains and probably belongs to the *N. viviparus* species complex which is unique to the Eastern Arc and Southern Highlands of Tanzania.

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African violet

The Eastern Arc mountains are home to more 3,473 species of vascular plants of which at least 453 species and 40 genera are endemic. One of the world's best-loved houseplants, with more than 20,000 cultivated varieties, the African violet (Genus *Saintpaulia*) originates from the Eastern Arc mountains and nearby lowland forests. All eight *Saintpaulia* species (two new ones were discovered in 2009) are found here, and there are dozens of subspecies, many endemic to the area. In the wild, *Saintpaulias* require a very special environment since they are sensitive to drought and to competition from other plants: most species live on steep rock surfaces in dense, moist shade where few other plants thrive. African violet habitats are being destroyed as tree-felling for firewood or agriculture exposes previously shaded cliffs. Some sixteen species of the closely-related Cape primrose (*Streptocarpus* spp.) are restricted to the Eastern Arc, while another group of plants popular with horticulturalists, the Busy Lizzies (*Impatiens* spp.) also has a centre of radiation in this region.

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The green dwarf chameleon

First described in 2006, is an Eastern Arc endemic, occurring only in the Pare Mountains. Like many other reptiles and amphibians found in this area, *Rhampholeon* dwarf chameleons are collected, even within protected areas, and exported to Europe and the US for the pet trade. Although there are export quotas for a few species, there are no effective controls: this is a very real threat to these restricted range species.

© TIM DAVENPORT / WCS



Kipunji

The discovery in 2003 of a new monkey in Tanzania's Southern Highlands, and a year later in a small part of the nearby Udzungwa Mountains rocked the conservation world – and demonstrates just how little we still know about these forests. It has been assigned to an entirely new genus and has been dubbed *Rungwecebus kipunji* after Mount Rungwe, the peak in the Southern Highlands where one population is found. Kipunjis are large monkeys which inhabit the montane forests and form multi-male groups, often associating with other primate species. They have a diverse diet – including leaves, fruits seeds, bark, lichen, moss and invertebrates – and they sometimes climb down from the trees to raid crops. DNA analysis has recently unearthed an intriguing mystery about these monkeys – the Southern Highland population has traces of baboon DNA, which may mean they interbred with baboons sometime in the past. This shy monkey has been classified as Critically Endangered by IUCN. The total population is estimated at only around 1,100 individuals. Its two known locations are under increasing threat from deforestation and local people sometimes hunt Kipunjis and other primates for food.

SAVING SPECIES SAVES LIVELIHOODS: A CASE STUDY FROM THE COASTAL FORESTS

Dalbergia melanoxylon – the Mpingo or African blackwood tree – is facing extinction in the region due to its high value. Its wood is in demand for making high quality musical instruments such as clarinets, oboes and piano keys, and for making woodcarvings for tourists. The Mpingo is slow-growing, taking 70 – 100 years to reach good harvestable diameters for commercial purposes. It grows in a broad range of conditions ranging from sea level to 1500 m a.s.l. and is a widespread species, but its population has plummeted in recent years due to overharvesting.

A number of initiatives have been put in place to divert the wood carving industry away from Mpingo to other hardwoods and farm-grown tree species. Other initiatives are in place to ensure the sustainable management of the remaining Mpingo

natural woodlands, especially in southern Tanzania. Community involvement, linking with the wood carving industry backed by certification processes, are showing promise for the conservation of this endangered species.

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THE MPINGO IS
SLOW-GROWING, TAKING
70-100
YEARS
TO REACH GOOD
HARVESTABLE DIAMETERS
FOR COMMERCIAL PURPOSES



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WWF's Global and local partners

WWF has been working with partners and international organisations to save the remaining Mpingo trees in Coastal Eastern Africa. In Kenya, WWF has been working since 2003 with a number of partners to facilitate FSC certification. Some success has been achieved with community groups and cooperatives involved in woodcarving. In Tanzania, WWF has supported the Mpingo Conservation Project which has been key in facilitating FSC certification of a Village Forest Reserve dominated by Mpingo trees. In Mozambique, the FSC certification process is well advanced and focuses on large-scale timber concessionaires and associations. There is also a new initiative to certify community forests in Beira province.

Addressing the international market chain

WWF, in collaboration with the Mpingo Conservation Project in Kilwa, Tanzania, has initiated a project that will produce the first-ever FSC certified musical instruments, linking to the markets for Mpingo timber in the Far East (starting with Vietnam), through the market chain to producers of musical instruments in Europe. The Kenya Gatsby Trust, with support from WWF, has successfully established links with some of the markets for this wood in America.

Easing certification processes in the Region

WWF has been facilitating the development of national certification standards within the region and these accommodate all forest certification issues. Wood demand for the carving industry in Kenya is estimated to be 30,000 cubic meters per year. Most of this is now coming from sustainably produced wood of exotic planted trees such as neem, jacaranda or mango. Six Kenyan woodcarving cooperatives have now been certified by FSC: the process is focused on farm-grown trees, starting from the tree grower to the woodcarvers

with a certified chain of custody. Other opportunities for 'green' woodcarving enterprises are presenting themselves and there is a move to certify coconut as a carving wood in the coastal province. In Tanzania and Mozambique, the certification process is expected to be completed in the near future.

Meeting the Challenge of Mpingo conservation

Due to its slow growth rate, foresters have not promoted Mpingo as a commercial tree species for agroforestry or plantations. It is therefore important to focus on preserving the remaining wild populations. Areas that still support wild Mpingos are being opened for access to markets, posing further challenges to ensure their long term conservation and sustainable exploitation. Add to this the fact that agricultural development for food and biofuels is a serious threat to the remaining Mpingo habitats and it becomes clear that urgent action must be undertaken to ensure the survival of this species.

Certification is an expensive process and needs a high initial investment that will demonstrate its value in the long run. Moreover, the market for high quality musical instruments is far away from the producers in terms of distance, development and revenues involved. The value of Mpingo wood attributed by the end user (the musician) must be translated to the communities that manage the remaining woodlands and forests in Coastal East African countries. However, we have learned lessons from the certification initiatives currently underway in Kenya, Tanzania and Mozambique. Perhaps the main one is that the business community in Eastern Africa are keen to adopt certification measures, and that working with local communities, large scale farmers and forest concessionaires, we can secure the remaining Mpingo tree habitats. A thought for the future: Mpingo is a high value timber species and this is a new area for serious investors.

COASTAL EAST AFRICA'S BIODIVERSITY – A CALL TO ACTION

The past century has seen an exponential increase in the human populations of eastern Africa. As elsewhere in the world, pressures on wildlife and their habitats are also increasing. The major threat in the coastal forests and Eastern Arc is habitat loss and fragmentation due to clearance of forest for agriculture, fuelwood (including charcoal), timber, and settlement. While the Eastern Miombo Woodlands have a much lower human population density and are intact within protected areas, close to urban centres they, too, are being lost. Miombo woodlands and coastal forests in southern Tanzania and northern Mozambique have experienced a worrying upsurge in uncontrolled, unsustainable, and partly illegal commercial logging during the last decade, with huge quantities of hardwoods exported, primarily to China. Habitat loss is also being driven to some extent by infrastructure developments such as roads, pipelines, and oil, gas and mineral extraction – all an inevitable result of much-needed development. Poverty is the major driving force behind wildlife poaching for meat, although there is some commercial poaching of elephants for ivory. Corruption also plays a role in unsustainable land-use practices. The potential effects of climate change remain a big unknown – experts believe that tropical regions will bear the brunt of adverse changes which may have grave consequences for species that are less mobile or have limited ranges (as endemic species have), and especially for those living in montane habitats within a narrow altitudinal range. Finally, trade and governance failures at all levels are hindering our efforts to conserve species and their habitats.

Together with the Governments of Mozambique, Kenya and Tanzania, the region's people, and its development and conservation partners, WWF is working to meet these multiple challenges by:

Demonstrating the value of biodiversity and transforming conservation on the ground.

We are working to develop systems of interlinked and climate change resilient protected areas by connecting existing parks and reserves via corridors – for example in the Ruvuma Wilderness of southern Tanzania and north-eastern Mozambique, and in Tanzania's Eastern Arc mountains and lowland coastal forests. We are also assisting governments and industries to make more sustainable development decisions and land-use policies

by providing scientific data on areas of high conservation value and on the habits of wide-ranging species such as elephants and African wild dogs. Long-term finance for conservation action is being sourced through the creation of Trust Funds, Payments for Ecosystem Services (PES) initiatives, and grants through the UN-led Reducing Emissions from Deforestation and Forest Degradation (REDD) programme.

Engaging governments and local communities

Addressing governance shortfalls such as poor management, weak laws, inadequate law enforcement and corruption is a priority at every level: regionally, nationally and in the very communities dependent on natural resources for their survival. People are considered part of the solution for conservation success, and WWF is working to ensure that local communities gain the rights to manage their resources responsibly. Specific projects include:

- In Kenya's Kwale district, we are helping community members to find alternative sources of income and reduce their dependence on unsustainable natural resource extraction by providing microfinance opportunities.
- In the Ruvuma Wilderness we are supporting community Wildlife Management Areas where local people can take control of and benefit directly from their wildlife resources.
- In southern Tanzania's Coastal forests and the East Usambara lowlands we are developing Village Forest Reserves, again with the goal that people become directly involved in the management of their wildlife and habitats.

Reducing human impact through sound and equitable trade

WWF and its partners are working to improve sustainability along all links of the timber supply train, by helping local communities to harvest their timber sustainably and achieve FSC chain-of-custody certification (see the case study above), linking Chinese manufacturers to sources for FSC certified wood, and creating markets for FSC-certified wood products in Europe and North America. In Tanzania, a similar approach is being applied for charcoal production and its trade with Dar es Salaam.

APPENDIX 1: ENDEMIC SPECIES TABLES¹

Miombo Woodlands²

	Vertebrates					Invertebrates	Vascular Plants
	Mammals	Birds	Reptiles	Amphibians	Fish		
No. Endemics	7	18	71	25			>4000
Endemics as % of total species	c.2%	c.2%	c.18%	c.21%			c.54%

Coastal Forests³

	Vertebrates					Invertebrates	Vascular Plants
	Mammals	Birds	Reptiles	Amphibians	Fish		
No. Endemics	11	11	53	6	32		c.1750
Endemics as % of total species	7%	10%	c.57%	c.36%			

Eastern Arc Mountains⁴

	Vertebrates					Invertebrates	Vascular Plants
	Mammals	Birds	Reptiles	Amphibians	Fish		
No. Endemics	12	19	>32	>50			>453
Endemics as % of total species						c.80%	>13%

¹ These give an approximate number of known endemic species in each habitat. Some taxa (e.g. fish, invertebrates) are poorly known. New species are being discovered all the time and many may prove to be endemics.

² Includes species from the wider miombo ecoregion, including Eastern Miombo. Data from Neil Burgess pers.comm.

³ Endemics of the wider mosaic of habitats within the coastal forest ecoregion. Data from Burgess, N.D. and Clarke, G.P (Eds) (2000) and <http://coastalforests.tfcg.org>

⁴ Data from: UNESCO (2010). Nomination of Properties for Inclusion on the World Heritage List: Eastern Arc Mountain Forests of Tanzania. United Republic of Tanzania, Ministry of Natural Resources and Tourism; Burgess, N.D. et al. (2007).

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See also:

www.valuingthearc.org
www.naturalcapitalproject.com
www.worldwildlife.org/science/ecoregions
www.easternarc.or.tz
www.coastalforests.tfcg.org

For more information on specific projects, see:

www.worldwildlife.org/what/wherewework/coastaleastafrica/projects.html
www.wwf.panda.org/about_our_earth/ecoregions/eastafrica_coastal_forests.cfm



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