

2 Biodiversity

*All the **beasts** that roam the earth, and all the birds that **soar** on high are but communities like your own. (Qur'an 6:38)*

What is biodiversity?

Bio means life, and *diversity* means variety, so biodiversity means the variety of life. It includes all living things on the earth and in the ocean, from the biggest blue whales to the tiniest bacteria. Places where many different kinds, or '**species**', of living thing grow together, such as a **coral reef** or forest, are said to have **high** biodiversity, while places where only a few **species** live, like ploughed **fields** or urban areas, have **low** biodiversity.

Endemic species – Having lots of **species** is not the only important thing. It also matters whether those **species** are found all over the place, or only live in a few sites. **Species** only found in one place in the world are '**endemic**' to that area. **Endemic species** are very special. On islands, because populations of plants and animals are separated by the sea from other populations, they gradually change to adapt to local conditions. Over time, populations become so different from their relatives elsewhere that they become new **species**. Islands are therefore very important for biodiversity because they tend to have more **endemic species** than mainland areas of a similar size.

Biodiversity in Zanzibar: habitats and species

Marine habitats – There are many different marine **habitats** in Zanzibar – from the **shore** to the **open ocean**. Each **habitat** supports hundreds of **species**, and marine biodiversity in Zanzibar is famous all around the world. Many **species** spend part of their life in one **habitat** and the rest of it in another, so the diversity of **habitats** is very important.

Underwater **habitats** are hard to explore, but there is a huge amount to discover just by walking on beaches and intertidal areas at low tide. At first glance, **sandy shores** may not seem to support much life apart from coconut palms. But life here is hidden – you have to know where to look. Dig beneath the surface and you can find clams; ghost crabs live in burrows and scuttle across the beach so quickly you can hardly see them; hermit crabs are hidden too – in shells of other creatures. **Sandy shores** are essential nesting **habitat** for turtles, which come ashore at night to lay their eggs under the sand. Zanzibar has five **species** of marine turtle, the most common of which are the green turtle and the hawksbill. **Sandy shores** are also used by wading birds, that feed on fish and small shellfish: egrets, terns, plovers and many more. **Rocky shores** are great places to observe marine biodiversity. Rock pools hold crabs, sea urchins and young fish, and animals such as anemones and barnacles grow attached to rocks. These natural aquaria let you see a great diversity of amazing creatures without disturbing them. If you are very lucky you may even find an octopus. Many animals you can find are more **bizarre** than you could imagine! As the tide goes out, another ecosystem is exposed – **seagrass beds** grow in sand and mud. Seagrasses support a wealth of fascinating creatures – sea cucumbers, sea urchins, and many kinds of shellfish. On deeper **seagrass beds**, green turtles graze too.

Tembea ujionee!

- Turtle sanctuaries at Mnarani and Baraka Natural Aquariums in Nungwi
- Kizimkazi for dolphins
- Jozani forest for the endemic Colobus monkey
- Chumbe Island for coral
- Pemba for flying fox
- Menai Bay, Mnemba, Muyuni beach, Misali Island, and Vumawimbi for nesting turtles.

The most **spectacular** of our marine ecosystems are the **coral reefs**. Hidden beneath the waves are hundreds of **species** of brightly-coloured corals, sponges, crabs, lobsters, reef fishes, sharks, rays, and sometimes even the world's biggest fish – the whale shark! Beyond the reef in the **open ocean** there is still amazing wildlife to find – not least our native marine mammals: 8 **species** of dolphin, 3 whales, and the dugong. Spinner, Indo-Pacific bottlenose and Indo-Pacific humpback dolphins, sperm whales, pilot whales, and the huge humpback whale, are all found in Menai **Bay**.

Wild forest – Trees give forests a structure that provides a wide variety of places for different **species** to find a home. The more tree **species** growing in a forest, the more biodiversity it can support. The coastal forests of East Africa form one of the 25 most important forest areas in the world for biodiversity.

There are three main kinds of wild forest in Zanzibar. **Moist forest** is **lush** and green. The trees grow fast, big and tall, and when their leaves fall, they rot to form a deep fertile soil. Most of Zanzibar's moist forest is in Pemba, but in Unguja there is moist forest in the north and in Jozani. **Coral rag forest** grows in areas with lower rainfall, and its trees can survive drought. They grow in the coral rag, limestone which is very **porous** so rainwater drains away fast. The largest areas of coral rag forest in Zanzibar are on south-eastern Unguja. **Mangroves** grow along the coast and are salt tolerant. Mangroves are important because they are very productive (trees grow fast) and this growth provides lots of food for wildlife. Both main islands support large and important mangroves, which serve as nursery grounds for many **coral reef** fish.

Zanzibar is home to over 50 mammal **species**, including primates such as the **endemic** red Colobus monkey, blue Sykes' monkey, and 3 **species** of bush baby. We have two **species** of antelope, including the critically endangered Ader's duiker: there are fewer than 500 left in the world, almost all in Zanzibar. We also have 23 **species** of bat including the **endemic** Pemba flying fox. Small bats eat insects, while big ones eat fruit. One of the most incredible wildlife sights of Zanzibar is the migration of fruit bats at sunset from offshore islands where they sleep during the day, to the forests where they feed at night.

There are 177 **species** of bird, including brightly coloured sunbirds, majestic fish eagles, and songbirds which are hard to see but whose beautiful calls are easy to hear, especially before sunrise. Pemba is famous for its four **endemic** birds: the Pemba white-eye, Pemba green-pigeon, Pemba sunbird, and Pemba scops-owl.

There are several **species** of snake and lizard, most famously the chameleon, which can change colour to match its background! There are some very special invertebrates too, including the rare giant coconut crab, and thousands of insects: beautiful butterflies, dancing dragonflies, flickering fireflies and the ambush hunter, the praying mantis.

The human landscape – Much of the land on Zanzibar has been changed by humans – farmland, villages and towns. But there is still biodiversity here. Farmland is important for birds, bees and butterflies, and provides corridors that wildlife can use to move between natural forest areas. Even in villages, there is wildlife, as many woodland **species** can live around humans, as long as we leave some trees and bushes for them among our houses.

Why does biodiversity matter?

Biodiversity is important because living things depend on each other for food and a place to live and breed. As living things ourselves, we are part of the web of life, and we too depend on a diversity of living things for our food, for the air we breathe, and for our livelihoods. If we upset the balance of nature by causing **species** to die out, the system becomes unbalanced, and whole ecosystems can collapse. Sometimes this makes the areas **uninhabitable** for people, for example it may turn them into deserts: if all the trees are cut down, the soil blows away and little can grow.

Health – Plants provide the oxygen we need for life. Growing plants even absorb greenhouse gases, reducing climate change impacts. The natural world is beautiful; people who live or spend time in natural places are healthier than those who live in polluted areas. Hundreds of plants are used in traditional Zanzibar medicine. It is important to conserve forest diversity to protect these plants, and others too, as scientists are always searching for new and better cures.

Ulikua unajua...?

- The Pemba flying fox is one of the biggest bats in the world! It weighs half a kilogram and has a wingspan a metre wide!
- Some people (known as birders) love birds so much they keep a list of all the different birds they have ever seen. Birders go on days out and even holidays especially to see more birds. Other people prefer to look for fish, orchids, trees, bats, butterflies or snakes! They never harm or kill the animals or plants, just admire them in their natural habitat. What kind of wildlife do you like best?

Water – Forests stimulate rainfall by slowing clouds down as they move over the land. Vegetation filters water making ground water safe for us to drink. Areas rich in vegetation slow down surface water flow, so water soaks into the ground instead of flowing away and washing soil into the sea.

Food – Biodiversity provides us with the hundreds of fish we eat and the wood we need to make the traps and build the boats to catch them, and fires to cook them on. Insects, bats and birds all help pollinate the crops we grow. Creatures in the soil, too small to see, break down dead leaves, turning them into rich soils to grow crops; birds, snakes and **predatory** insects eat crop pests.

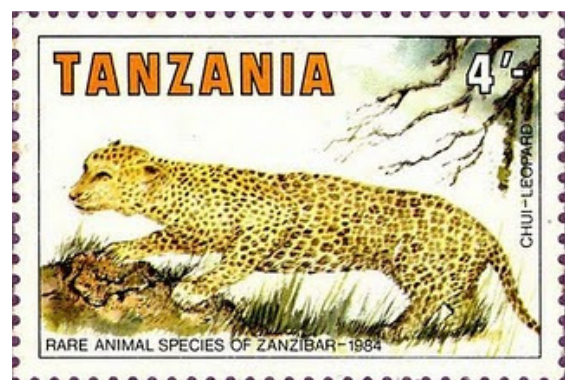
Shelter – Trees reduce the impact of wind in **storms**, and provide shade from the sun for our families, homes, livestock and crops. The raw materials we use to build our homes – the different kinds of timber, poles, thatch, and limestone – all come from the natural world.

Livelihoods – The richness of Zanzibar’s wildlife attracts thousands of tourists every year – to visit Jozani forest, swim with dolphins, snorkel and scuba dive. All workers in fishing, farming, or tourism rely on a countless variety of animals and plants, big and small, for their livelihoods.

Why is Zanzibar’s wildlife in danger?

When the population of a **species** is low and falling, the **species** is in danger of dying out, or ‘**endangered**’. This can be because of a threat to the plant or animal itself, or because its **habitat** – the place where it lives – is being damaged or disappearing. Humans compete with plants and animals in Zanzibar for resources and living space, and some **species** have already been lost – biodiversity in Zanzibar is declining.

Direct killing – Some **species** are killed **deliberately**. For food, we harvest huge quantities of fish every day, and some people hunt antelope too. We cut down trees for firewood, charcoal, timber for houses, fishing boats and furniture. Some **species** are harvested for commercial reasons – tritons, other shellfish and turtle shells are traded as ornaments, and shark fins are exported. We kill some animals – such as snakes – because we are afraid of them. Sometimes direct killing is not **deliberate**; marine mammals and turtles drown in fishing nets. Direct uncontrolled killing has a huge impact on populations and many of these **species** are endangered – including sharks, turtles, dolphins and tritons. For one **species**, which was unique to Zanzibar, it is too late: the Zanzibar leopard was hunted to **extinction** in the 1990s.



Already rare when this stamp was printed in 1984, Zanzibar leopards are now **extinct**

Habitat loss through degradation and destruction – In the sea, we are damaging **coral reefs** and **seagrass beds** with destructive fishing gear such as drag nets and **dynamite**. Coastal development and erosion means turtles can no longer find dry sand at the top of beaches to lay their eggs, and when their eggs **hatch** at night, the baby turtles get confused by bright lights from hotels, so they walk the wrong way and can’t find their way to the sea! **Quarrying** for sand and limestone rock is a very serious problem both on beaches and inland. Forests are being cut down across Zanzibar, but especially along the coastline, to make way for farms, roads, houses and hotels. Shifting cultivation – cutting down or burning an area of forest in order to grow crops, then moving on to a new area after a few years – is still taking place, but the way it is being done now is unsustainable. Traditionally the old **fields** were left so the forest would re-grow, but now so many people need farmland that the forest is not given time to recover.

Invasive species – Sometimes, as people move around the world, they take animals and plants from one place and introduce them to another where they do not belong. Usually they do not survive, but if they have no natural **predators** in the new place, they may reproduce rapidly and **devastate** populations of local plants or animals, disrupting the natural balance of the ecosystem. Ships bring rats to islands, where they **swiftly** wipe out ground-nesting seabirds. Zanzibar’s worst invasive **species** is the introduced Indian house crow. Crows are everywhere, feeding on food and

vegetable waste – and on native birds and their eggs, lizards, frogs, and other small animals. Populations of native **species** are declining throughout Zanzibar, but especially in Pemba where two of the four **endemic** bird **species** are now feared **extinct**. Domestic cats can cause problems if they go wild: they breed rapidly, have no **predators**, and feed on small mammals, birds and lizards.

Pollution – Waste management in Zanzibar is not adequate, and plastic, chemicals, sewage and many other materials are causing serious problems for biodiversity. Chemicals, especially pesticides, poison wildlife; plastic fragments escape into the environment where many animals mistake them for food so their stomachs fill up and they starve. Indirectly, pollution is encouraging the increase in the house crow population with serious knock-on effects for wildlife.

How can we protect biodiversity?

If we do not take action to protect Zanzibar's endangered **species** and their **habitats**, we will lose much of our **precious** biodiversity, more **species** will become **extinct** and much of what makes Zanzibar so special will disappear.

Protect endangered species – We depend on fish, so to ensure our fish will still be here in the future we must avoid catching or eating **species** which are endangered, and we must not use destructive methods to catch them: sharks, marine mammals and turtles are all worth far more to us alive. If you are lucky enough to encounter a nesting turtle, do not disturb it or its eggs; if the nest is in danger, turtle conservationists can collect the eggs to keep them safe until they **hatch**, then the newly-hatched babies can be released back into the sea. Hotels on beaches where turtles nest should not have any bright lights pointing at the beach which would confuse the babies. Instead of using timber from wild forests, choose faster growing **species** such as coconut and casuarina, grown in sustainable plantations where new trees are planted to replace those cut down.

Protect habitat – When we cut down forest, many wild plants and animals lose their homes, another reason to protect it. We must respect no-harvesting rules in our protected areas. There are 6 marine protected areas (p. 21), and six National Forest Protected Areas, three in Pemba (Ngezi-Vumawimbi Nature Forest Reserve, 2,900 hectares, Ras Kiuyu Forest Reserve, 270 ha, and Msitu Mkuu Forest Reserve, 180 ha) and three in Unguja (Jozani-Chwaka **Bay** National Park, 5,000 ha, Kiwengwa-Pongwe Forest Reserve, 3,325 ha and Masingini Catchment Forest, 285 ha). Biodiversity can generate sustainable jobs, for example through eco-tourism: tourists will pay more to visit areas with high biodiversity, enough to pay for its protection. Chumbe Island Coral Park employs nearly 50 people to staff the **eco-lodge** and protect the forest and **coral reef habitat**, paid for by tourist dollars. Places with lower biodiversity are still important – it is important to preserve patches of trees throughout the landscape to encourage birds, bats, bees and other pollinators.

Control invasive species – **Eradicating** invasive **species** is expensive and challenging, but can be achieved. Chumbe Island Coral Park successfully **eradicated** both rats and crows: rats were poisoned and crows have been trapped and shot. **Eradicating** crows from Zanzibar will be a much bigger job, and require collaboration between NGOs, government and local people. We can all help discourage invasive **pests** by covering **compost heaps** and rubbish bins. The government is planning a programme to trap and shoot crows. While complete **eradication** is unlikely, the work should reduce the number so native bird populations can **flourish** again. There are many domestic cats living wild in Zanzibar – responsible citizens should have their pet cats **neutered** to reduce the number of unwanted and **abandoned kittens**.

Reduce pollution – Avoid using pesticides on your crops – grow organic fruit and vegetables instead. Support community recycling schemes, and use toilets – don't help yourself in bushes or on the beach!

Kitunze kidumu!

- Support wildlife in your community by leaving areas of wild vegetation and planting trees, bushes and flowers, which are beautiful, reduce erosion, improve soil, provide shade and attract wildlife.
- Buy fruit that has been organically grown (without pesticides).
- Set up a wildlife-watching club in your school or community and explore wild Zanzibar together.
- Never drop litter.