

## Masoala: A unique partnership for conservation

Alex Rübel, Matthew Hatchwell and James MacKinnon

First of all, Madagascar is one of the world's top three biodiversity hotspots. Due to its long independent evolutionary history, its flora and fauna developed separately from the large continents of Africa and Asia. Thanks to its varied topography, geology and climate, rich and diverse flora and fauna have developed with high levels of endemism and representatives of primitive taxa found nowhere else on earth. This richness in biodiversity culminates in the rainforest zones. The Masoala peninsula contains the largest remaining block of rainforest in Madagascar.

Over the past twelve years, a unique alliance has evolved for rainforest conservation in Madagascar that combines the diverse talents of Zoo Zürich, the Wildlife Conservation Society, the national parks service (ANGAP) and a range of other national and international partners. Beside managing the park, many research and community projects all around the peninsula are stabilizing the conservation work.

Masoala National Park in northeastern Madagascar with a size of 2,300 km<sup>2</sup> is the largest and probably the richest protected area in a country that is classed, in its entirety, as a hotspot of biological diversity and therefore a global priority for wildlife conservation. At the time being it is screened for a world heritage site which we hope will be approved during the EAZA campaign. The park is situated on a peninsula to the east of Antongil Bay, whose forested slopes are thought to contain half or more of all the plant and animal species known to exist in Madagascar. It contains coral reefs – the underwater equivalent of rainforests in terms of their species diversity – and rainforests running uninterrupted from the coast all the way up to more than 1300 m above sea level. Masoala is the only home in the world of the beautiful red-ruffed lemur and harbors such rare birds as the serpent eagle and red owl. Discoveries new to science among its plants, insects, reptiles and amphibians are commonplace. Humpback whales and hammerhead sharks breed in nearby Antongil Bay, sea turtles lay their eggs on its sandy beaches, and it is one of the few remaining places on the east coast of Madagascar where the endangered dugong survives. For centuries, local people have known the peninsula as Masoala – the Eye of the Forest – a perfect name for this sparkling jewel of life on earth.

### Box 11. Illegal logging of hardwood

Over 25 species of ebony (*Diospyros*) occur on the peninsula, several of which have commercial value, and indeed the northeast of Madagascar seems to be a centre of diversity for this family. Masoala also harbors high densities of species from the genus *Dalbergia*, including several pallisandre species and the renowned Malagasy rosewood. Protecting a genetic reservoir of these important commercial species is an important role for Masoala National Park. Even though the park was carefully designed to leave enough forest outside it to continue harvesting this valuable resource, uncontrolled timber exploitation has left few large trees outside park boundaries. Trying to stop illegal felling in the park is a constant struggle for park managers.

Why Masoala should have so many species of commercial value is a mystery. One possible explanation is that high-density woods, which give these species their value, are better able to withstand the impact of cyclones than other species. Thus, the frequent damage wrought by the cyclones actually gives them an ecological advantage in the forests. The possibility has not been researched, but there is some support for the idea since hardwoods seem to be more common on the exposed east coast of the peninsula than on the sheltered western slopes.

The geography of the peninsula increases its biological value. Its centre is mountainous and densely forested and its long coastline varied in structure with many different habitats such as coral reefs and extensive littoral forests. To the west, the peninsula forms Antongil Bay, a relatively quiet bay that provides the setting for the famous Nosy Mangabe Special Reserve, created in 1966 as an island refuge for aye-ayes introduced from the Malagasy mainland. The peninsula is still relatively remote and not easy to reach either by land or sea. In the past, its human population was very low, which helps to explain the relatively untouched state of its forests. But the need for conservation measures at Masoala is just as great as the value of its biodiversity: the latest estimate is a population of about 85,000 people living in an area of 450,000 hectares, which translates into a human population density of 20 people per square kilometer – still low by many standards, but high enough to explain the accelerating degradation of Masoala's forests.

### **Box 12. Nosy Mangabe**

The Nosy Mangabe Special Reserve, managed together with Masoala National Park is the smallest protected area in the ANGAP network, an uninhabited island of 520 hectares in the northern part of Antongil Bay across from the town of Maroantsetra. It is 30 min boat ride from Maroantsetra and a favorite for all tourists visiting Masoala. Black and white ruffed lemurs, *Uroplatus* and *Brookesia* can be seen on a visit, and if you are really lucky and stay overnight, it is one of the best places to see the famous aye-aye.

One lemur species, the red-ruffed lemur, is unique to the Masoala peninsula. It is amongst the most beautiful of the lemurs and the haunting calls of the competing family groups can be heard every morning throughout the rainforest. During the day, another species, the white-fronted brown lemurs, can be encountered in large groups. Seven nocturnal lemur species occur at Masoala, including the strange aye-aye. Some of the easiest nocturnal lemurs to find are the mouse lemurs, as their eyes reflect back in the torchlight during a nighttime stroll.

Masoala also has a rich carnivore fauna, with records of 9 species, including the puma-like fossa, and one of the least known carnivore species, the brown mongoose. Bats are well-represented at Masoala, with both insectivorous and fruit-eating species. One, the sucker-footed bat, represents an endemic family for Madagascar.

The tenrecs are probably the most ancient of Madagascar's mammals. These insectivores retain primitive characteristics that more advanced mammals have lost.

Of the 22 raptors recorded from Madagascar, 19 have been found on the peninsula and researchers from The Peregrine Fund have confirmed nesting records for many of them. Masoala is thought to be the main stronghold of the Malagasy Serpent eagle, which was only rediscovered during the 1980s after being thought extinct for several decades. The serpent eagle is a large bird for the rainforests, measuring up to 65 cm from beak to tail. As its name suggests, this raptor feeds mostly on snakes and lizards, but it will occasionally take small lemurs. Another powerfully-built and rare raptor, Henst's goshawk, commonly takes lemurs. The red owl, a close relation of the European Barn owl, is another of Masoala's biological jewels. Discovered only in 1993, this rare species remains little-known and appears to be restricted to the forests of the east and northeast of the island. In total, 94 of Madagascar's 203 resident bird species have been recorded at Masoala. Apart from the birds of prey, other highlights include the ground-dwelling and elusive red-breasted coua and ground-rollers, the pygmy kingfisher, which captures insects rather than fish, and the helmet vanga.

Madagascar's reptiles and amphibians are amongst the most beautiful of the island's biological

treasures. Most of them are endemic. Masoala is home to the largest and amongst the smallest of the chameleons. The largest chameleon, *Calumma parsonii*, is frequently seen at Masoala, and is reputed to take not just the usual insects but occasionally birds with its sticky, darting tongue. By contrast the tiny *Brookesia peyrerii*, which is little longer than a fingernail, is almost invisible to the untrained eye in the leaf litter where it lives.

The most spectacular snakes are the large boas and the thin Langaha whose arrow-shaped heads have given rise to the Malagasy legend that they spear their prey by dropping on them from trees. Masoala is also one of the best places to find the extraordinary *Uroplatus* leaf-tailed geckos. In contrast to the cryptically camouflaged *Uroplatus*, the *Phelsuma* geckos are colored with bright greens, reds and blues.

Some frogs specialize in living in the tree canopy, others in the pools of water that accumulate in tree hollows, while others are cryptically colored and almost impossible to tell apart from the leaves that litter the forest floor. Some of the best-known species of the region are the tomato frog, so called for its beautiful bright red coloration and the those of the genus *Mantella*.

Masoala's three marine parks were amongst the first to be created in Madagascar. They protect a variety of habitats, including coral reefs, seagrass beds and mangroves. Although species diversity in these reefs, mangroves and seagrass beds is extremely high, they have low endemism by comparison to Madagascar's terrestrial environment since ocean currents disperse eggs and the young of most marine species over enormous distances. Nevertheless the protection of marine habitats is essential not only for their biodiversity value, but also for the ecological services that they provide. All these ecosystems are important as areas for fish and invertebrate reproduction, as well as for nutrient recycling and protecting the coast from erosion.

On the east coast of Masoala, an outer fringing coral reef gives protection to a shallow lagoon within which smaller blocks of corals are found, and where seagrass beds and mangroves can develop in the less turbid water.

The fish of coral reefs come in a dazzling array of colors, forms and life-styles. Amongst them are the parrotfish, the predatory groupers and moray eels and other carnivores such as snappers. Corals, worms, snails, limpets, clams, mussels, starfish, urchins and sea cucumbers to name but a few.

**Box 13. Masoala's carnivorous plant: *Nepenthes masoalensis***

One of Masoala's best-known plants is an endemic pitcher plant that is restricted to a handful of sites on the east coast of the peninsula. The *Nepenthes* pitcher plants are best known from Southeast Asia and particularly Borneo. Madagascar has two species of these fascinating carnivorous plants, which are found on nitrate-poor soils, particularly in areas that are waterlogged. To make up for the lack of useable nitrate in their environment, the plants have evolved a system whereby they capture insect prey and digest them to obtain the essential nutrients that they are unable to absorb from the soil. Insects that are lured into the pitcher, which is a specialized leaf, drown in a liquid rich in enzymes that are able to break down the insect's body.

The best-known visitors to the bay d'Antongil are the humpback whales. The bay is a globally important breeding site for humpback whales. From July to September each year hundreds of these huge mammals migrate from the nutrient-rich Antarctic to the warmer waters around northern Madagascar. Here they spend the winter months giving birth and mating, particularly in Antongil Bay. A long-term research project, run since 1997 by the American Museum of

Natural History and the Wildlife Conservation Society, has identified over 1200 individual whales in the bay. Several females are known to have returned to give birth over the years. Although it is difficult to estimate the total size of the population, it is clear that several hundred whales visit the bay each year.

Half or more of the country's species, or some two percent of the world's living organisms, are found in the forests around the Antongil Bay including the Masoala peninsula. Masoala is also the last place in the country where tropical rainforest still extends down to the sea. Thus the national park protects two of Madagascar's rarest habitats – its lowland and coastal forests – as well as extending into the mangroves and coral reefs of the marine environment.

In addition to rainfall brought in by winds off the Indian Ocean, Madagascar is often hit by cyclones. These cyclones have a devastating impact on people living along the coast and can also have a huge effect on the environment. The forests of the east are probably well-adapted to the natural effects of cyclones and are able to recover after a few years. However, in the current situation with the additional human pressures, the effects of a cyclone can be devastating. Large amounts of dead wood increase the risk of fire during the short dry season between October and January, and in the aftermath of cyclones people turn to the forests to hunt and for new land to replace areas that have been ravaged by flooding.