ENDEMISM GONE WILD

The forgotten bird islands of São Tomé and Príncipe

TEXT BY MARTIM MELO & PETER RYAN

From the peak of São Tomé on a rare clear day, you can see the entire island below you: precipitous ridges clothed in primary forest, with agricultural land beyond. You can make out the routes taken by intrepid 19th-century naturalists and the places where you have wandered for days, lost in the constant rain. From within, the forest appears infinite, but from above it seems so small. It is almost inconceivable that this tiny area could support 20 endemic bird species. ▷

ALEXANDRE VAZ

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AUGUST THOMASSON

Above *The imposing dome of Boné de Jóquei (Jockey's Cap) set against a turgid tropical sky. The oil palms that cover the lower slopes of this small islet off the coast of Príncipe produce unusually large fruits, which are the main food of an endemic form of Príncipe Seedeater.*

Opposite *The São Tomé Oriole is just one of 20 endemic species confined to the forests of São Tomé. Like many island birds, it is less brightly coloured than its mainland counterparts; this is a female and so is particularly drab.*

Previous spread *A magnificent male São Tomé Paradise Flycatcher glares at the camera after being caught in a mist net. Depicted in field guides as a rather drab black flycatcher, it is amazingly iridescent. And unlike many of the São Tomé endemics, it is not restricted to primary forest, but is also found in secondary growth and farm bush.*

Islands are special places for naturalists. Their isolation allows unique species to evolve, often including 'strange' creatures that are adapted to island life. These peculiarities contributed significantly to Darwin and Wallace's understanding of evolution, inspired by the Galápagos and the islands of South-East Asia respectively. São Tomé and Príncipe, two small islands 200 kilometres off the coast of Gabon, are equally fascinating. The biota of these former Portuguese colonies is so distinct that their forests constitute an independent eco-region. Birds are the most visible component of the unique species composition and are recognised as important ambassadors for the conservation of the remaining forest, appearing on the island nation's coat of arms, stamps and currency.

Relative to their size, São Tomé and Príncipe are the islands with the greatest number of endemic birds globally, with 17 species confined to São Tomé (857 square kilometres in extent), eight restricted to Príncipe (139 square kilometres) and three shared between the two. By comparison, the Galápagos islands have 22 endemics in a land area almost 10 times greater. Only the Hawaiian islands, 20 times larger, support more endemic birds (30 extant species, plus 19 extinctions in historical times). The Democratic Republic of São Tomé and Príncipe is the second smallest country in Africa (after the Seychelles), yet ranks fourth in terms of the number of endemic birds. It's not surprising that each island is recognised as a separate Endemic Bird Area by BirdLife International.

Together with Bioko and Annobón (which belong to Equatorial Guinea), São Tomé and Príncipe form the Gulf of Guinea islands group, part of a 1600-kilometre line of volcanoes that extends south-west from the Mandara Mountains (along the Nigeria/Cameroon border) and includes Mount Cameroon. São Tomé, Príncipe and Annobón are oceanic islands that have never been connected to the mainland or to each other, being separated by seas more than 1 800 metres deep. Although Annobón is the smallest (17 square kilometres) and most isolated island, it still supports two endemic bird species, a white-eye and a paradise flycatcher. Bioko is the largest island (2 027 square kilometres) in the group, yet it has only two endemics (a white-eye and a batis) because it was connected to Africa during the last glaciation, some 11 000 years ago. The four islands may be quite old, having formed some five to 30 million years ago, but genetic studies suggest that their 32 endemic bird species are the result of recent speciation events rather than being relict species that went extinct on the mainland.

RELATIVE TO THEIR SIZE, SÃO TOMÉ AND PRÍNCIPE ARE THE ISLANDS WITH THE **GREATEST NUMBER OF ENDEMIC BIRDS GLOBALLY**

Given their remarkable number of endemics, São Tomé and Príncipe rank high on any African birder's must-visit list. Lying close to the equator, the islands were covered in dense rainforest when they were discovered by the Portuguese in the 15th century. All the endemic birds evolved in these forests. Extensive areas of the islands have since been modified by agriculture, but the rugged terrain has meant that sizeable tracts of primary forest have been preserved. Entering these forests is like stepping into a new world; with a few exceptions (several African bird species have been introduced), all the birds encountered here occur nowhere else. In addition to this astonishing endemism, more than 80 per cent of the land snails are endemic, as are eight reptiles and seven amphibians (which is amazing, given their intolerance of salt water). Mammals are well represented ▷

ALEXANDRE VAZ

NIK BORROW

Top *Trees grow straight and true in the few remaining tracts of primary forest on São Tomé. Fortunately for birders, there are few species confined to the distant canopy.*

Above *Like most white-eyes, this Príncipe Speirops is quite curious and confiding. Despite its large size and aberrant plumage, recent molecular data show that speirops do not form a natural group, having evolved separately on São Tomé/Príncipe and Bioko/Mount Cameroon (see box opposite).*

ONE OF THE MORE STRIKING ASPECTS OF BIRDING ON THE ISLANDS IS WHAT IS MISSING; THERE ARE NO HORNBILLS, WOODPECKERS, BARBETS, ROBINS OR BULBULS

by bats, including diurnal species that have evolved in the absence of forest raptors. Each island also has a shrew, although it is hard to imagine how these small animals, which need to feed every few hours, managed to colonise the islands. Plant variety is also impressive, with some 200 endemic flowering plants and the highest diversity of ferns in Africa.

Although the endemic birds have evolved quite recently, they include many interesting forms, including the world's largest weaver (Giant Weaver), sunbird (Giant Sunbird) and seedeater (São Tomé Grosbeak), together with the smallest ibis (Dwarf Olive Ibis). This follows a common island pattern whereby small species increase in size relative to their mainland counterparts, and large species become smaller. This is probably because small species can expand their niches by becoming larger in the absence of competitors on islands, whereas large species are constrained by the limited space available. There have also been two adaptive radiations which until recently have been overlooked: one features the islands' white-eyes (see opposite), the other the Príncipe Seedeater and its large cousin, the São Tomé Grosbeak.

The São Tomé Oriole has lost most of its relatives' yellow pigment, lending support to the hypothesis that sexual selection is reduced on islands. There is also the elusive São Tomé Fiscal, the only closed-forest shrike in the world, and two species so peculiar that their affinities were unknown until recently. Dohrn's Thrush-Babbler, which welcomes you to Príncipe with its loud, melodic song, is now known to be a sylvid warbler, closely related to the African Hill-Babbler. The rather drab São Tomé Short-tail, which is confined to the primary forests of São Tomé, is so odd that it ▷

THE DEMISE OF SPEIROPS

Parallel evolution in Gulf of Guinea white-eyes

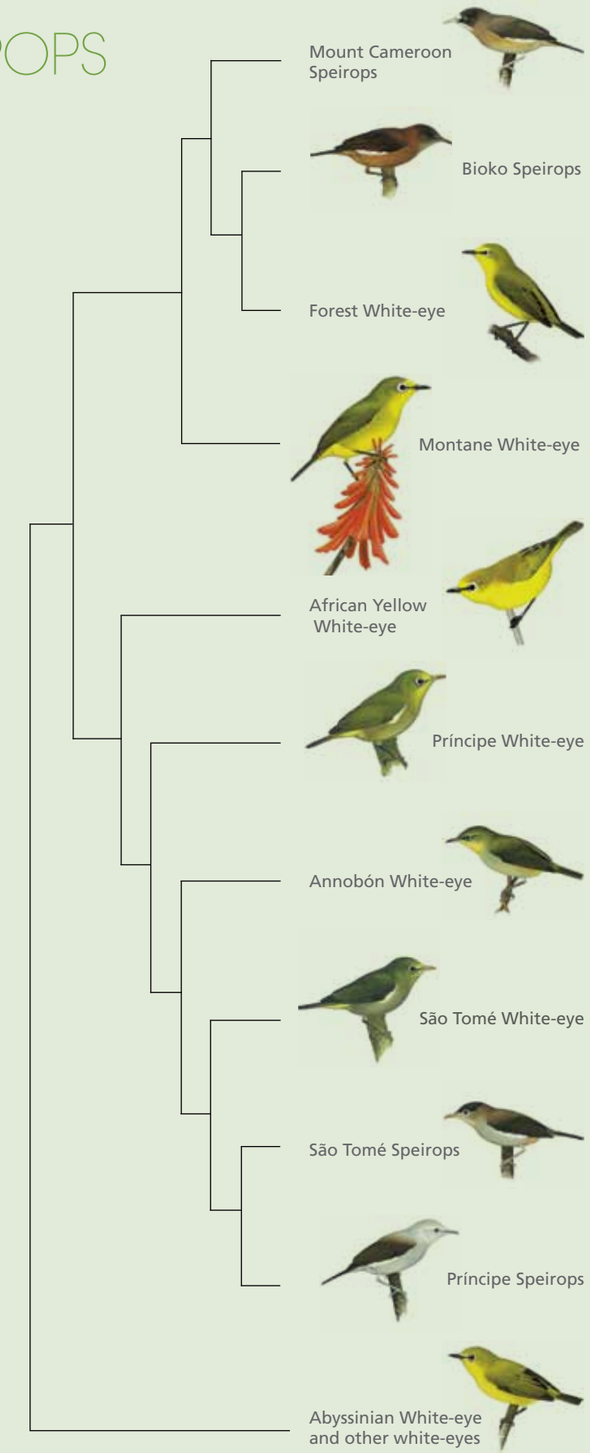
The white-eyes (family Zosteropidae) make up a small, homogenous group allied to the babblers and sylvid warblers. With many island forms, the species-level taxonomy is somewhat contentious, but the *Handbook of the Birds of the World* recognises 98 species in 14 genera. Of these, 74 species are placed in *Zosterops*, making it the largest bird genus.

Only two genera are represented in Africa: some 22 species of *Zosterops* occur throughout sub-Saharan Africa and adjacent islands, and four species of *Speirops* are confined to a line of volcanoes extending from Mount Cameroon into the Gulf of Guinea. Speirops are larger than typical white-eyes, have stout bills and lack green or yellow coloration in their plumage. The ranges of the four species do not overlap, with one species occurring on Mount Cameroon and one on each of the three large islands in the Gulf of Guinea: Bioko, Príncipe and São Tomé.

Traditionally, the São Tomé Speirops is considered to be closely allied to the Mount Cameroon Speirops and it has been argued that the genus evolved on São Tomé, radiating from there to the adjacent islands and Mount Cameroon. However, recent research by Martim Melo and his colleagues turns these ideas upside down (*Molecular Ecology* 20: 4953–4967). Evidence from several genetic markers shows that speirops do not constitute a natural group, with the continental forms on Mount Cameroon and Bioko closer to the Forest and Montane white-eyes, whereas the Príncipe and São Tomé speirops make up part of a radiation of white-eyes on the oceanic islands in the Gulf of Guinea that is linked to the African Yellow White-eye (see figure).

This might seem unlikely, given the similarity in structure within *Speirops*. However, the four species of *Speirops* differ considerably from each other (for example, some have eye-rings and others don't), and their defining character is more one of difference from the typical white-eyes. They provide yet another example of parallel evolution, whereby the same morphological traits evolve independently when organisms face similar environments. It remains to be explained quite what has driven the parallel evolution in this case. However, all four species co-occur with a typical white-eye, and they characteristically are more abundant than their smaller relatives.

The Gulf of Guinea white-eyes join a select group of island birds that have undergone adaptive radiation (others are Darwin's finches, Hawaiian honeycreepers, Madagascar's vangas and, at a much smaller scale, Tristan da Cunha's finches). In terms of phylogenetic theory, *Speirops* can no longer be treated as a separate genus. Several other small genera within the Zosteropidae have also been found to be recently evolved offshoots from *Zosterops* white-eyes. In addition, Melo's study revealed that the two subspecies of Príncipe White-eye found on Príncipe and São Tomé are not sister taxa and so should be treated as separate species. It also confirms that the Forest White-eye is distinct from the African Yellow White-eye, and that the Taita White-eye is not related to the Abyssinian White-eye complex.



ILLUSTRATIONS REPRODUCED FROM BIRDS OF SUB-SAHARAN AFRICA *(STRUIK NATURE), COURTESY OF DAWIE CHAMBERLAIN*

MARTIN DALLIMER

MARTIM MELO (2)

Top *The Príncipe Thrush is inexplicably rare compared to its close relative on São Tomé. It differs from the São Tomé Thrush by having a darker breast, bright yellow bill, and paler eyes and legs.*

Above *The enigmatic São Tomé Grosbeak was known from only three skins collected in the 19th century until it was rediscovered in south-west São Tomé in 1991. It is now known to be a giant relative of the abundant Príncipe Seedeater.*

Opposite *Birds are not the only attraction to the islands. Reaching the best birding areas can be an adventure in itself. Here two guides cross the mouth of the São Tomé River on Príncipe.*

event. The islands' volcanic origin and high rainfall also played a role, creating a spectacular landscape of towering mountains, deep valleys and volcanic plugs. This topographic diversity created local microclimates, increasing the possibilities for successful colonisation by many different plant and animal species. That said, one of the more striking aspects of birding on the islands is what is missing; there are no hornbills, woodpeckers, barbets, robins or bulbuls.

Why have the endemic birds survived? Almost all bird extinctions during the past 500 years have occurred at oceanic islands, yet as far as we know, no species has disappeared from São Tomé and Príncipe. Compare this with St Helena, a considerably smaller island in the tropical Atlantic that was discovered 30 years later; it has lost at least eight species and only one endemic survives.

São Tomé and Príncipe were settled in the 1490s by a mix of Jewish exiles, slaves and prisoners. Agriculture grew rapidly and by 1529 São Tomé was the world's primary producer of sugarcane, largely at the expense of the lowland forests. Only the southern forests were spared because of their inaccessibility and extremely high rainfall (more than seven metres per year). We don't know what impact the loss of the lowland forest had on the birds, because ornithological work only began in the late 1800s. The exploration of lava tubes for sub-fossil remains may yet reveal that some species went extinct before being described.

With the decline in sugarcane production in the 17th century, the islands' economy relied on supplying slave ships en route from West Africa to America. The introduction of coffee and cocoa in the 19th century led to further destruction of the forest up to an altitude of 1 200 metres. From 1908 to 1919 São Tomé and Príncipe was the world's largest cocoa producer, but then manufacture began to fall, particularly after World War II. Following independence in 1975, many plantations were abandoned, leading to the expansion of secondary forest. As a result, forest cover is at its highest for the past 150 years and this may explain why some exceptionally rare species appear to be making something of a recovery. For example, the São Tomé ▷ was suggested to be a relic from the lineage that gave rise to the furnariids of Central and South America. In fact, genetic data show it to be a 'tail-less' wagtail, which you can well believe when you see it nervously high-stepping across the forest floor.

How did such high levels of endemism arise? The islands' geographic situation played a key role. The Congo rainforest, one of the richest centres of biodiversity in the world, provided a large pool of potential colonisers. Furthermore, the islands are not too far offshore to make colonisation unlikely, but they are sufficiently distant to make the evolution of colonisers in isolation from their source populations a rare

KNOW BEFORE YOU GO

Given their amazing birdlife, stunning scenery, rich history, friendly inhabitants and diverse cuisine, it is surprising that São Tomé and Príncipe have largely been ignored by independent birders. Permission to visit the islands was hard to obtain after independence from Portugal in the 1970s, but these days they are readily accessible. São Tomé can be reached by air from Libreville (45 minutes), Luanda (two hours) or Lisbon (six hours). Príncipe is a 35-minute flight from São Tomé. Accommodation ranges from a basic '*pensão*' at around US$20 per night to upmarket hotels and lodges. Apart from two main local languages, Portuguese is widely spoken, French is the second most spoken language, and you will hear English used by hotel staff and some guides.

You will need a tourist visa to enter the country (bear in mind that obtaining a tourist visa is tricky if there isn't a consulate or embassy in your country). Malaria is the main health concern, but the situation has improved dramatically in the past five years. The only dangerous snake is the black cobra, believed to have been introduced to control rats in plantations on São Tomé. As in any tropical area, care should be taken with water consumption.

All the endemic birds can be seen at any time of year, but it is best to avoid the rainy season. June–August and December–January are the drier periods, although February can be good for visiting São Tomé's southern forests.

Many of the endemic birds are easily seen in farm bush, but visiting primary forest is essential for locating some species. On São Tomé, the forest surrounding Lagoa Amélia, above Bom Sucesso Botanic Garden, is a good place to find the more common endemics, including the now scarce Maroon Pigeon. For the more intrepid, a two-day hike to São Tomé peak offers unforgettable views and guarantees the pigeon and, with luck, all the endemics except the Dwarf Olive Ibis. The ibis is now confined to the south-east of the island, where it is most accessible around Ribeira Peixe, on the old Monte Carmo estate. The São Tomé Grosbeak also occurs in this area, but is easier to find in the south-west, where the São Tomé Fiscal is also more common. This requires a one- to two-hour boat trip from Santa Catarina to São Miguel, followed by a couple of hours' hike into the interior. It is best to spend a couple of nights in the forest to ensure that you get to grips with all the endemics.

On Príncipe, most endemics are easily found along the path from the main town to Bela Vista or the path from the airport to Ribeira Izé. Visiting the southern forests of Príncipe is essential for the Príncipe Thrush, and the best bet for finding the scarce Príncipe White-eye. It is also where there have been several reports of an undescribed small owl. Access is simplest by boat, which also allows you to see the subspecies of Príncipe Seedeater confined to Boné de Jóquei (Jockey's Cap), two kilometres off the south-east coast.

The Tinhosas Islets, 20 kilometres south of Príncipe, support up to a million seabirds, including Brown Boobies, Sooty Terns, and Black and Brown noddies. This makes the Tinhosas the most important seabird site in the eastern tropical Atlantic. Do not land on the islets: besides being extremely dangerous, it causes great disturbance to the birds. To hire a boat, contact the Bom Bom Island Resort or ask for the owners of *cariocos* or *botes*.

The Monte Pico Association will help with guides and other arrangements. Monte Pico is not active on Príncipe, but can provide the necessary contacts. Bikegila is the guide who knows where the more tricky birds occur. Locally based companies (Navetur-Equatour and Mistral Voyages) specialise in nature tourism. If you want to avoid the hassle of arranging your own logistics, several bird tour companies visit the islands, often coupled with trips to Gabon (for example, Birding Africa, BirdQuest and Tropical Birding). By working with Monte Pico guides, they support local conservation efforts.

FÁBIO OLMOS

Above *This photograph of a male Giant Weaver doesn't do justice to the bird's most striking attribute – its giant size. From a distance, females can be confused with a São Tomé Oriole.*

Right *In a country with four Critically Endangered birds, the Dwarf Olive Ibis is probably the most threatened. Barely 200 survive in the south–central region of São Tomé, where they are at constant risk from illegal hunting.*

Opposite *The islands are not just about forest birds; the rich seas support large numbers of tropical seabirds. Breeding species include Brown Boobies (shown here), White-tailed Tropicbirds, Common and Black noddies, and Sooty and Bridled terns. There is probably also a little-known population of Band-rumped Storm-Petrels; birds are occasionally attracted to lights at night in the forested interior of São Tomé, suggesting that they breed on the main island. Given recent splits of Band-rumped Storm-Petrels at other Atlantic Ocean breeding sites, this might even represent another endemic species for the islands.*

TASSO LEVENTIS

Grosbeak, which went missing for 101 years after three were collected in 1888–90, is now known from several sites in central and southern São Tomé.

Cocoa is currently the most important cash crop, which is good for birds. The trees require shade to grow properly and are planted beneath a canopy of taller trees that make a 'shade forest', a structure that mimics the original rainforest and supports most of the endemic birds. Some of these species are common even in the capital city, notably the São Tomé Prinia which, with its noisy wing-snapping display and repetitive call, is the country's unofficial 5 a.m. alarm clock. But 11 species are Threatened and an additional three are categorised as Near-Threatened – and the recent split of the white-eyes is likely to further increase this tally. Four species are Critically Endangered: Dwarf Olive Ibis, Príncipe Thrush, São Tomé Fiscal and São Tomé Grosbeak. Of these, the ibis is perhaps most at risk because of ongoing illegal hunting, a threat that also faces the increasingly rare Maroon Pigeon.

The future of the endemic birds of São Tomé and Príncipe, and the islands' other biodiversity, depends on the effective conservation of the primary forests. In early 2006 almost a third of each island was declared a natural park (Parque Natural do Obô), which includes most of the remaining primary forest and a buffer zone of secondary forest. Nevertheless, because of the small size of the islands, conservation efforts cannot be limited to these protected areas. With a human population growth rate of three per cent per year, demand for environmental resources – and ultimately for access to the protected areas – will increase. Agricultural land already covers about half the islands, and finding a model of sustainable agriculture is one of the country's highest priorities.

The conservation challenges are great, but more and more people in São Tomé and Príncipe are facing up to them. Besides the government initiatives, two NGOs are playing key roles. The Monte Pico Association brings together the people with the best knowledge of the forests. They supply the guides who can take you to the most difficult endemics and are often the people carrying out environmental awareness and reforestation campaigns, maintaining forest trails or working in the botanic garden and herbarium. The STP Biologists' Association is the local affiliate of BirdLife International and is the Species Guardian of three Critically Endangered species. Its members conduct censuses of the Dwarf Olive Ibis population, 'converting' hunters into field assistants in the process.

The two organisations often collaborate and recently published the first ornithological paper written by Santomeans. The growing awareness among the inhabitants of the islands' extremely rich environment, together with readily available international help, gives some hope that São Tomé and Príncipe may yet be spared the massive extinctions and ecological havoc typical of most oceanic islands. The victory is not certain, but the signs are definitely encouraging. □

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CHRISTIAN BOIX

RESOURCES

BOOKS

Guide des Oiseaux de São Tomé et Príncipe. Christy, P., Clarke, W.V. (1998) ECOFAC, São Tomé (*www.ecofac.org*). All birds illustrated, good texts (in French), birding itineraries. Available through NHBS (*www.nhbs.com*), but considerably cheaper on São Tomé (check availability with the Monte Pico Association).

The Birds of São Tomé & Príncipe: A Photoguide. Leventis, A.P., Olmos, F. (2009). A nicely presented Portuguese–English guide with photos of all endemics and most other birds. Available from STP Biologists' Association or NHBS; proceeds support conservation projects.

Field Guide to the Birds of Western Africa. Borrow, N., Demey, R. (2004) Christopher Helm, London. The Gulf of Guinea islands' endemics are conveniently grouped; laminated colour copies of these plates are handy in the field.

The Birds of São Tomé and Príncipe, with Annobón: Islands of the Gulf of Guinea. Jones, P.J., Tye, A. (2006) British Ornithologists' Union, Oxford. A detailed introduction to the islands and their birds, with a fully referenced checklist.

ONLINE RESOURCES

Gulf of Guinea Islands' Biodiversity Network (*www.ggcg.st*). Although not regularly updated, this remains a good website for those interested in the biota of the Gulf of Guinea islands.

Island Biodiversity Race (*www.calacademy.org/medialibrary/blogs/gulf of guinea/*). Blog about the California Academy of Sciences' research into biodiversity on the Gulf of Guinea islands.

Monte Pico Association (*montepico.blogspot.com*). President: Luis Mário Almeida (*lumanovamoca@hotmail.com*).

STP Biologists' Association: Hugulay Maia (*hugulaymaia25@hotmail.com*).

Travel info: *www.saotome.st/travel.php* and *www.navetur-equatour.st*