# LA RÉUNION AND ILES EPARSES

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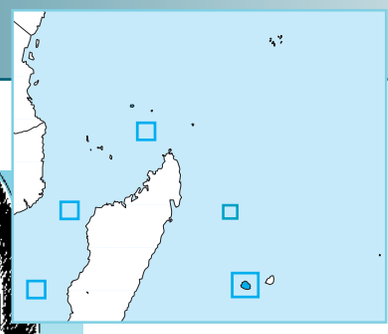

Réunion Cuckoo-shrike
*Coracina newtoni*.
(ILLUSTRATION: DAVE SHOWLER)

## GENERAL INTRODUCTION

Two very distinct territories, Ile de la Réunion, usually (and henceforth) known as La Réunion, and Iles Eparses, are considered in this chapter, because they are both French dependencies in the Malagasy faunal region, and the latter is administered primarily from the former. However, general information is provided below separately.

### La Réunion

La Réunion is a mountainous island covering 2,512 km² in the tropical south-west Indian Ocean. It is the westernmost of the Mascarene island chain, a volcanic archipelago which includes two other high islands: Mauritius, 164 km to the east-north-east, and Rodrigues, a further 574 km east. The Mascarenes have never been united or connected to another land mass. The nearest continental neighbour of La Réunion is Madagascar, 600 km west.

The human population was estimated at 682,000 in 1998, growing at 1.3% annually. La Réunion is an overseas Département of France, and is divided into four arrondissements, subdivided into cantons and communes. The head of state is the President of France, represented locally by the Préfet de la Réunion. Local affairs are governed by the Préfecture, Conseil Général and Conseil Régional, all based in the administrative capital, Saint-Denis.

La Réunion is dominated by two overlapping shield volcanoes. The older, extinct one is centred on Piton des Neiges, the highest point in the Mascarene Islands and indeed the whole Malagasy region (3,069 m). This massif has eroded spectacularly into gorges, ridges, and three cirques resembling amphitheatres around 10 km across, but with outlets to the sea formed by gorges a few hundred metres wide. The younger volcano, Piton de la Fournaise (2,631 m), is still active and retains its domed shape with a central crater. Away from the cirques and gorges, the land slopes gradually down to a coastal plain a few kilometres wide. Two major physical differences from the other Mascarene Islands are that, firstly, 61% of the island lies more than 1,000 m above sea-level (the highest point on Mauritius is 824 m) and secondly, around the 201 km of coastline, reefs (20 km long) and islets are almost absent.

The climate is dominated by the south-east trade winds and by tropical depressions. The mountains, especially in the east, are extremely humid, most receiving 2,000–5,000 mm (but locally up to 9,000 mm) of rainfall annually; mean annual temperatures are below 16°C over a wide area, with frosts frequent in winter above 2,000 m. For at least part of most days the slopes from around 1,500–2,500 m are shrouded in cloud. The leeward (western) lowlands are drier and hotter (less than 2,000 mm rainfall, annual mean temperature 23–25°C). The wettest, hottest months are from December to April, while September to November are driest, and June to August are coolest. The heaviest rainfall is brought by cyclones; these are less frequent than in the other Mascarene Islands, but have produced the world's highest rainfall in a 24-hour period (1,840 mm at Cilaos in 1966).

The Mascarene Islands once supported one of the richest and most extraordinary vertebrate faunas of any oceanic archipelago. Since human colonization, most native vertebrate species have been exterminated and the majority of the native vegetation destroyed by habitat destruction, hunting and the effects of introduced plants and animals. La Réunion retains a much larger area of ecosystems dominated by native species than the other islands (around seven times that on Mauritius), but has suffered a comparable extinction rate.

Diverse types of dry and wet forest and scrub once covered the whole island. Of 546 native flowering plant species, about 30% are or were endemic to La Réunion, with a further 25% Mascarene Island endemics. The native fauna includes or included at least 52 native, breeding vertebrate species (birds, bats and reptiles). Of these, 27 (52%) are or were endemic to La Réunion, and a further seven (13%) are or were endemic to the Mascarenes. Of 451 moth species recorded, 148 (33%) are endemic to La Réunion and 19 (4%) to the Mascarenes. However, these species totals are preliminary, as ongoing taxonomic, historical and osteological studies still reveal additional species among the extinct and extant fauna.

**Map 1.** Location and size of Important Bird Areas in La Réunion and Iles Eparses.

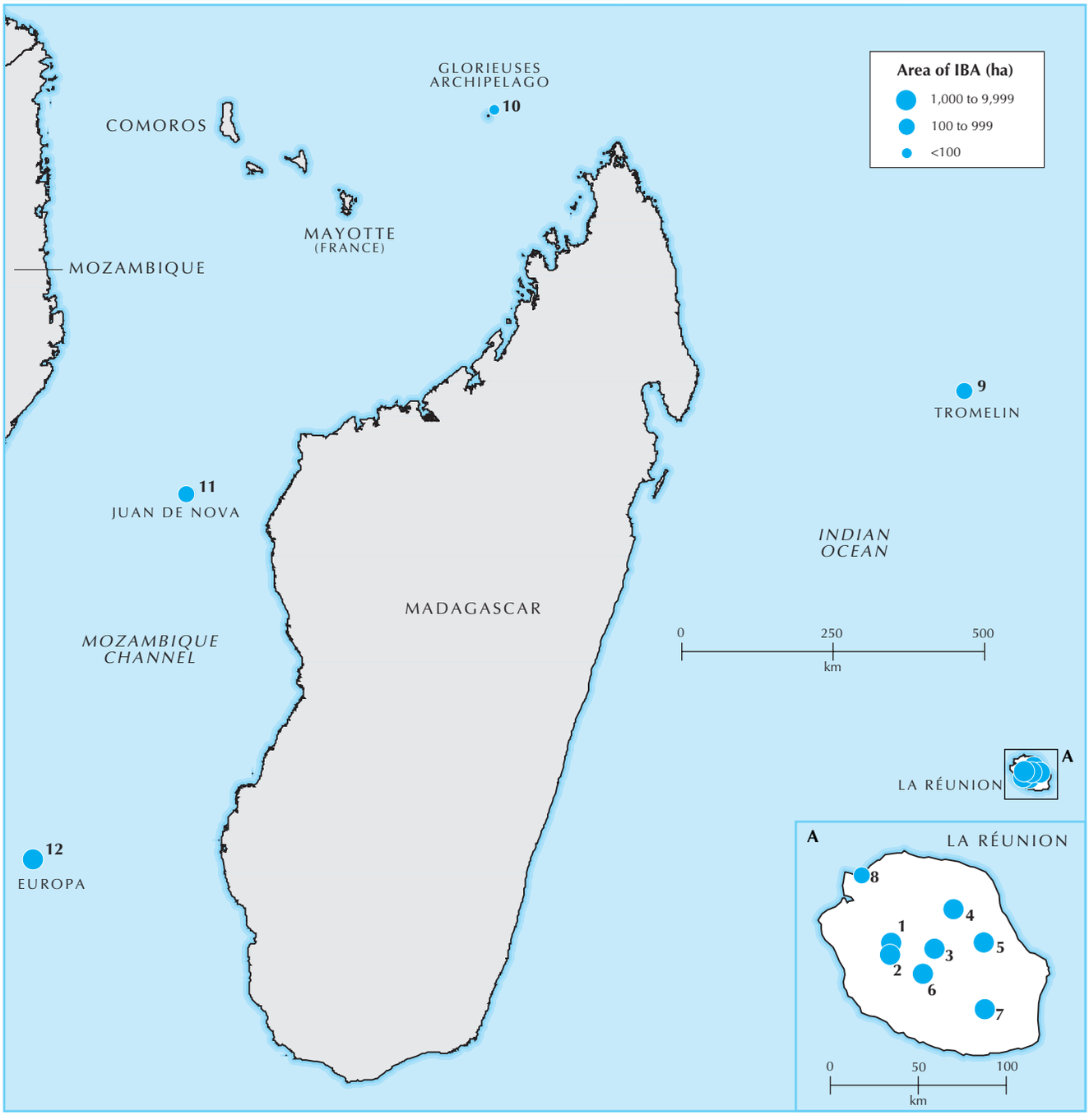


**Table 1.** Summary of Important Bird Areas in La Réunion and Iles Eparses. 12 IBAs covering c.256 km²

| IBA code | Site name | Administrative region | Criteria (see p. 11; for A2 code, see Table 2) A1 | A2 101 | A4i | A4ii | A4iii |
|---|---|---|---|---|---|---|---|
| **RE001** | Piton des Neiges–Gros Morne | Salazie, Saint-Louis | ✔ | ✔ | | ✔ | |
| **RE002** | Grand Bénard–Tapcal | Saint-Louis, Saint-Paul | ✔ | ✔ | | ✔ | |
| **RE003** | Plaine des Chicots–Plaine d'Affouches | Saint-Denis | ✔ | ✔ | | ✔ | |
| **RE004** | Mouth of the Cirque de Salazie | Bras Panon, Salazie | ✔ | ✔ | | ✔ | |
| **RE005** | Rivière des Marsouins–Grand Etang | Saint-Benoit | ✔ | ✔ | | ✔ | |
| **RE006** | Grand Bassin–Le Dimitile | Entre-Deux, Le Tampon | ✔ | ✔ | | ✔ | |
| **RE007** | Rivière des Remparts–Rivière Langevin | Saint-Joseph | ✔ | ✔ | | ✔ | |
| **RE008** | Ravine de la Grande Chaloupe | Saint-Denis, La Possession | ✔ | ✔ | | | |
| **RE009** | Tromelin | Iles Eparses | | | | (✔) | |
| **RE010** | Ile du Lys, Glorieuses Archipelago | Iles Eparses | | | ✔ | | ✔ |
| **RE011** | Juan de Nova | Iles Eparses | | | ✔ | | ✔ |
| **RE012** | Europa | Iles Eparses | ✔ | | ✔ | ✔ | ✔ |
| | Total number of IBAs qualifying: | | 9 | 8 | 3 | 9 | 3 |

Since their permanent establishment in 1646, human colonists have brought about the loss of 75% of the native vegetation area (around 650 km² remain) and 50% of the native vertebrate fauna (including 55% of the birds). At least six plant species and 21 vertebrates have become globally extinct, while 18% of the native flora and 35% of the surviving vertebrates have been reduced to threatened or near-threatened status. In addition, numerous plant and animal species have been introduced, of which c.592 plant, eight mammal, 20 bird, 12 reptile and two amphibian species have become naturalized.

Native species and ecosystems on La Réunion are threatened by exotic species invasion. Degradation by exotic plant species invasion takes the form of a gradual shift in floristic composition towards the exotics. Of at least 32 invasive plant species, the most damaging include *Ligustrum robustum*, *Psidium cattleianum*, *Rubus alceifolius*, *Fuchsia magellanica*, *Hedychium gardnerianum*, *Boehmeria macrophylla*, *Boehmeria penduliflora* and *Lantana camara.* Several exotic animals affect the native flora, for example by destroying native plants, seedlings, fruit or seed, or by spreading exotic plants; birds (especially *Pycnonotus jocosus*), hares *Lepus nigricollis*, deer *Cervus timorensis*, goats *Capra hircus*, rats *Rattus rattus* and *R. norvegicus*, and giant snails *Achatina* spp. are likely culprits. Exotic animals also affect native fauna, as predators (especially *R. rattus* and feral cats). Some may also be resource-competitors and vectors for exotic pathogens (such as viruses and blood parasites) that cause diseases. The introduction of further exotic species, especially from nearby Mauritius, is a major threat to native wildlife; the monkey *Macaca fascicularis* (abundant on Mauritius) would probably be the most damaging. Once established on the island, exotic plants and animals are not excluded by protected areas. Therefore, active management is required, even in nature reserves, if conservation is to be achieved.

Four direct human threats to bird populations and habitats now exist. First, illegal hunting has long affected native wildlife, and continues with guns, snares or lime. In 1989–1992, many of the endemic *Pterodroma baraui* were shot as the birds crossed the coast en route to their breeding colonies; once discovered, this practice was largely halted by an effective anti-poaching campaign. Second, opening of new paths and tracks into forest areas facilitates invasion by exotic plants and access by poachers. Third, fire is a threat to several areas, especially drier sites. Finally, young petrels and shearwaters (Procellariiformes, two of which are threatened, endemic species) taking their first flights at night are often disoriented by artificial lights and killed before reaching the sea. A programme to rescue disoriented birds (especially *Pterodroma baraui*: 500 birds in 1998) is carried out each year.

### Iles Eparses

The Iles Eparses are widely scattered islands or archipelagos in the south-west Indian Ocean: four are in the Mozambique Channel (from north to south, the Glorieuses archipelago, Juan de Nova, Bassas da India and Europa) and one (Tromelin) lies east of Madagascar. The Iles Eparses form a French overseas territory, but are administered principally from La Réunion. Bassas da India is a reef covered at each high tide. The other four are widely spread and ecologically distinct from each other; all contain Important Bird Areas and so have site-accounts (RE009–RE012), where most information is given. A few general characters are set out in this section.

Four of the areas are, or contain, Nature Reserves (including Bassas da India; the exception is Juan de Nova), and no economic activity takes place on any of the islands. The total population of around 40 is composed of military personnel and meteorological station staff. The largest area, Europa, covers 3,000 ha.

All islands are low, almost flat, coralline in composition, and experience average temperatures around 21–22°C and a wet season from November to March. Rainfall varies from the sub-arid Europa (annual rainfall 530 mm) to the much wetter Tromelin (1,100 mm) and Glorieuses (1,000 mm).

The native fauna and flora are very poor in species. The habitats includes low scrub, thickets, grassland, beach, dunes and, on Europa, also dry forest and mangrove. Europa, with the richest wildlife and largest areas of native vegetation, supports 33–46 native angiosperm species, four terrestrial reptiles and 13 nesting bird species. No endemic vertebrate species are known from any of the islands, but Europa holds four endemic subspecies (two birds and two reptiles).

Wildlife has been affected in the past by habitat clearance by humans (except Europa), and direct persecution and disturbance, particularly affecting seabirds. By the 1990s, these direct threats were under control and fire, exotic plant species invasion, browsing and grazing by exotic mammals (especially goats) and predation by exotic mammals (especially *Rattus* species) were the main threats.

## ORNITHOLOGICAL IMPORTANCE

### La Réunion

As expected for any remote, oceanic island, La Réunion is poor in species, but has a high proportion of threatened and endemic taxa. The present avifauna of around 78 species comprises nine native landbirds, eight breeding native waterbirds and seabirds, 32 regular migrants (including all seabirds that do not regularly breed), nine accidentals, and 20 naturalized exotics. The waters around La Réunion support a wide range of non-breeding seabird species, but these are not considered in this analysis. Populations of migrants (mainly shorebirds) are not important internationally.

La Réunion supports four endemic landbird species, of which one is threatened: *Coracina newtoni* (EN), *Hypsipetes borbonicus*, *Saxicola tectes* and *Zosterops olivaceus*. Three landbird species are shared only with Mauritius: *Collocalia francica* (NT), *Terpsiphone bourbonnensis* (endemic, nominate subspecies) and *Zosterops borbonicus* (endemic, nominate subspecies). All seven are restricted-range species which make up the Réunion Endemic Bird Area (EBA 101). Three further species of global conservation concern are the two endemic petrel species (Procellariidae), *Pterodroma aterrima* (CR) and *Pterodroma baraui* (CR), together with *Circus maillardi* (NT), which is shared with Madagascar and the Comoros, but represented on La Réunion by the endemic, nominate subspecies. Globally significant numbers of *Puffinus lherminieri* (endemic subspecies *bailloni*) nest. Fieldwork in the 1990s has produced totally unexpected evidence (but not proof) of the survival of a native owl on La Réunion. If confirmed, this is most likely to be the endemic *Mascarenotus grucheti*, which is known only from sub-fossil remains and therefore presumed long extinct; it would be an extraordinary discovery.

Most native landbird species are widespread in native forest, and some, especially *Zosterops borbonicus*, also use exotic vegetation. However, *Coracina newtoni* is restricted to 16 km² of forest in the far north. *Pterodroma baraui* nests in a few colonies at high altitude in the centre of the island, and the nest-site of *Pterodroma aterrima* is unknown, although one general area is suspected. *Circus maillardi* and *Collocalia francica* are widespread but scarce breeders, the former between sea-level and 1,500 m, the latter in caves.

### Iles Eparses

Large seabird populations on the Iles Eparses include significant breeding congregations of *Sula sula*, *S. dactylatra*, *Fregata ariel*, *Phaethon lepturus* (with the endemic race *europae* on Europa), *Phaethon rubricauda* and *Sterna fuscata*, among other species. The seabird community of Europa is isolated and distinct from other

**Table 2.** The occurrence of restricted-range species at Important Bird Areas in La Réunion and Iles Eparses. Sites that meet the A2 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **bold blue**.

**101 – Réunion Endemic Bird Area** (seven species in La Réunion and Iles Eparses; eight sites meet the A2 criterion)

| IBA code: | 001 | 002 | 003 | 004 | 005 | 006 | 007 | 008 |
|---|---|---|---|---|---|---|---|---|
| ***Collocalia francica*** | | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| ***Coracina newtoni*** | | | ✔ | | | | | |
| *Hypsipetes borbonicus* | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| *Saxicola tectes* | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| *Terpsiphone bourbonnensis* | | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| *Zosterops borbonicus* | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| *Zosterops olivaceus* | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Number of species recorded: | 4 | 6 | 7 | 6 | 6 | 6 | 6 | 6 |

seabird communities in the region, indicated by the presence of an endemic breeding subspecies, and a unique composition of colour-morphs of *S. sula*. Europa also holds the only known nesting *Ardeola idae* (NT) outside Madagascar and Aldabra.

## CONSERVATION INFRASTRUCTURE AND PROTECTED-AREA SYSTEM

### La Réunion

A Direction Régionale de l'Environnement, representing the Ministry of the Environment, was established in Saint-Denis in 1992. Its mission includes developing measures for nature conservation. Most of the forest is the responsibility of the Office National des Forêts (ONF). Much native forest was altered or destroyed by forestry management between 1960 and 1985, but ONF has recently increased efforts to conserve primary forests, which are no longer subject to sylvicultural management. Forest exploitation is now limited to secondary forest and plantations of exotic *Cryptomeria japonica*, of which no new plantations are to be created; a gradual decline in *Cryptomeria* is therefore expected. A Brigade de la Chasse et de la Nature has been created by the Direction Régionale de l'Environnement and the Office National de la Chasse, to help control poaching and educate the public on the island's wildlife. Le Conservatoire des Espaces Littoraux et des Rivages Lacustres (usually referred to as Le Conservatoire du Littoral), a state organization, acquires and protects littoral or lake areas with ecological or landscape interest. Several non-governmental organizations are concerned with the environment of La Réunion, in particular the Société Réunionnaise pour la Protection de l'Environnement et de la Nature (SREPEN) and the Société d'Etudes Ornithologiques de la Réunion (SEOR). All native birds are protected; *Hypsipetes borbonicus*, the last to be protected, gained this status in 1989. Legal hunting is restricted to six exotic species. All release of exotic animals is forbidden.

Three categories of protected area exist at present: Réserve Naturelle, here called Nature Reserves; areas designated under an Arrêté de Protection de Biotope (Biotope Protection Decree), here called Protected Biotopes; and Réserve Biologique Domaniale, here called State Biological Reserves. Other sites have been acquired by Le Conservatoire du Littoral for conservation purposes. Recognizing that the existing network is inadequate to ensure conservation of the native wildlife of La Réunion, the authorities are planning further protected areas, including establishment of a large area in a new, third category (National Park). Existing and proposed categories are described below.

- Nature Reserve—Two sites, totalling c.3,700 ha. Mare Longue, established in 1981, contains 68 ha of the richest lowland rainforest in the Forêt de Saint-Philippe. The Nature Reserve of La Roche Ecrite, 3,600 ha, established in December 1999, protects the forests of the Plaine des Chicots and Plaine d'Affouches region (IBA RE003), including the entire known population of the endemic *Coracina newtoni*.
- Protected Biotope—Two sites, totalling 1,820 ha. La Petite Ile, 2 ha, an islet off the south coast, protected since 1986, holds the only nesting *Anous stolidus* on La Réunion and the largest colony of *Puffinus pacificus*. Two large mountainous areas totalling 1,818 ha (Piton des Neiges and Grand Bénard, IBAs RE001 and RE002 respectively), encompass all known colonies of *Pterodroma baraui* and were classified as a Protected Biotope in February 2001.
- State Biological Reserve—Six sites, totalling 13,101 ha. These sites are not so strictly or permanently protected as the above two categories, because limited forestry management is practised, and the reserves can be reappraised with each official adjustment of forest land.
- Other reserves—Nine sites have recently been acquired by Le Conservatoire du Littoral. Most are very small and of limited value for birds; the most important are La Grande Chaloupe (257 ha in 1995, with a further 97 ha acquired by the Département de la Réunion in 1996; a management plan is in preparation, and expansion proposed); Forêt de Bois Blanc (361 ha of native forest, with all native forest birds except *Coracina newtoni*), and Etang du Gol (30 ha, lake and wetland). A private reserve exists at Etang de Bois Rouge (29 ha of lake and wetland; protected since 1992). Of these four, only La Grande Chaloupe is here considered an Important Bird Area (IBA RE008). Sites totalling 366 ha have been acquired by the Département de la Réunion to slow urbanization and maintain natural landscapes.
- Reserves to be established—Studies towards the establishment of a National Park (Parc des Hauts) covering a large portion of the central mountains and native forest, are under way. Two new wetland Nature Reserves—Etang de Saint Paul and Les Lagons, neither of which is an Important Bird Area—are both in the planning stages.

### Iles Eparses

All islands are administered by the Préfet de la Réunion, which controls access by researchers and tourists. Glorieuses, Bassas da India, Europa and Tromelin became Nature Reserves in 1975. However, these designations have not been approved nationally, as they were decided by Arrêté Préfectoral by the Préfet de la Réunion and not by Decret Ministériel following the 1976 Law on Nature Protection. Classification as Strict Nature Reserves (Réserves Naturelles Intégrales) by Arrêté Ministériel is needed to strengthen the sites' protection. Juan de Nova is unprotected.

## INTERNATIONAL MEASURES RELEVANT TO THE CONSERVATION OF SITES

France has signed and ratified the Convention on Biological Diversity, CITES, the Ramsar Convention, the World Heritage Convention, the Convention on Migratory Species, the Convention on Climate Change, and the Convention to Combat Desertification, and it participates in the UNESCO Man and Biosphere programme. Other agreements include the International Tropical Timber Agreement 1983, United Nations Convention on the Law of the Sea (UNCLOS), and Convention on Fishing and Conservation of Living Resources of the High Seas.

## OVERVIEW OF THE INVENTORY

The inventory comprises 12 Important Bird Areas (IBAs): eight on La Réunion, and four on Iles Eparses (Map 1, Table 1).

### La Réunion

The eight sites on La Réunion cover 216 km$^2$ (9% of the island surface). Two occupy the highest summits in the zone dominated by bare rock and montane shrubland or bushland and thicket. Five are at medium altitudes, occupied by mixed moist evergreen forests (montane and lowland); some of these sites extend up to the high montane region. The eighth site is in the lowlands, and supports dry evergreen lowland forest, the island's most threatened habitat-type. One site (IBA RE003) is a Nature Reserve, and two (RE001 and RE002) are Protected Biotopes, while La Grande Chaloupe (RE008) is protected by other designations. The planned expansion of the protected-area system, in particular the creation of the Parc National des Hauts, will afford strong protection to most sites. Furthermore, natural protection is provided to several sites by the precipitous terrain. The restricted distribution of *Coracina newtoni* and the main concentrations of *Circus maillardi*, *Pterodroma baraui*, *Puffinus lherminieri* and probably *Collocalia francica* are known, allowing the inventory to cover these species fairly effectively. For *C. maillardi*, five or more pairs is here considered an important subpopulation. However, undiscovered colonies of the latter three species probably exist outside the site network presented here, and could add to the number of sites. The nesting sites of *Pterodroma aterrima* are unknown, but recent discoveries of disoriented juveniles attracted to lights have allowed tentative identification of one likely nesting area. The five non-threatened, restricted-range species are widespread on the island; seven of the eight IBAs contain populations of all five (Table 2). Some of the largest expanses of moist forest, such as La Forêt de Saint-Philippe (south-east) and Bébour–Plaine des Lianas (centre-east), are excluded from the inventory. They hold large populations of these five species, but less significant numbers of the rarer species. Although not considered here as Important Bird Areas at the global

level, they are nonetheless vital areas for conservation of native biodiversity.

### Iles Eparses

The four sites in the Iles Eparses cover around 40 km² (89% of the territory's land surface), with only Grande Glorieuse (around 500 ha) and Bassas da India (no permanent land) excluded. The distribution of seabird colonies is well known, although Juan de Nova has been visited by a naturalist only once in the last 40 years, which visit confirmed the survival of the large colony of *Sterna fuscata*, upon which that site's selection is based. Three of the four sites are protected, the exception being Juan de Nova.

## COMMENTS ON THE INVENTORY

- On La Réunion, a detailed classification for native plant communities was developed by Rivals (1952) and Cadet (1980). For the habitats mentioned in this inventory, the IBA habitats classification required by the present study (see Appendix 7) can be related to Cadet (1980, as translated by Thiollay and Probst 1999), as follows.

| *Cadet* | *BirdLife* |
|---|---|
| Dry woodland | Lowland forest—dry evergreen |
| Lowland wet forest | Lowland forest—mixed moist evergreen |
| Upland wet forest | Montane forest—mixed |
| High altitude heather | Shrubland or Bushland and thicket—montane |
| Fields, second growth | Exotic vegetation |

  The mixed forest formations are referred to locally as 'Bois de couleurs'.
- In Africa and Madagascar, montane forest is typically found only above 800 m, whereas in La Réunion it is found as low as 400 m.
- Place names and spelling follow those of the Institute Géographique National (1987). Most sites occupy more than one canton (IBA RE001 occupies four); the cantons that account for more than about 30% of a site are listed.
- No freshwater or estuarine wetlands on La Réunion are of global importance for birds, based on quantitative criteria for identification as Important Bird Areas.
- Information on taxonomy, endemism and distribution of non-avian taxa is taken mainly from the following sources: plants, Cadet (1980), Strahm (1993), Walter and Gillett (1998); moths, Viette and Guillermet (1996); reptiles, Cheke (1987a), Probst (1997). Additional information came from personal observation by the authors.
- The smaller endemic petrel, here called *Pterodroma aterrima*, probably belongs in the genus *Pseudobulweria* (Imber 1985, Bretagnolle *et al.* 1998). The endemic harrier taxon, here treated as a subspecies (*Circus maillardi maillardi*), has more recently been considered an endemic species, *C. maillardi*, leaving *C. macrosceles* (previously *C. maillardi macrosceles*) on Madagascar and the Comoros (Simmons 2000). Neither treatment affects IBA designations.

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## SITE ACCOUNTS

### Piton des Neiges–Gros Morne — RE001

**Admin region** Salazie, Saint-Louis
**Coordinates** 21°50'S 55°29'E — A1, A2 (101), A4ii
**Area** 2,000 ha **Altitude** 2,000–3,069 m — Protected Biotope

#### Site description

The site is made up of the mountainous massif that includes Le Piton des Neiges (3,069 m, the island's highest summit) and Le Gros Morne (2,991 m, the meeting point of the island's three cirques). Its formation resulted from the activity of the now extinct volcano, followed by its collapse and severe erosion. The lower parts (2,000–2,800 m) are covered by montane shrubland or bushland and thicket, whereas the summits are largely bare rock and volcanic scree. The area is uncultivated and uninhabited apart from a mountain refuge, and is used for recreation and tourism, especially hiking, climbing and helicopter trips.

#### Birds

See Box and Table 2 for key species. The site covers the most important known breeding area (at least four colonies) of the endemic *Pterodroma baraui* and could possibly support a small population of *P. aterrima*.

**Key species**

| | | | |
|---|---|---|---|
| A1 | *Pterodroma baraui* | | |
| A2 (101) | Réunion EBA: Four of seven species of this EBA have been recorded at this site; see Table 2. | | |
| A4ii | | Breeding (pairs) | Non-breeding |
| | *Pterodroma baraui* | 3,000–5,000 | — |

#### Other threatened/endemic wildlife

Endemic plant communities: distinctive montane vegetation with many endemic plants.

#### Conservation issues

Much of the site (around Le Piton des Neiges) has been classified under an Arrêté de Protection de Biotope since January 2001. This will regulate intrusive activities such as climbing and helicopter flights which are increasing in popularity and which may affect colonies of *Pterodroma baraui*. Operations to control introduced vertebrates are also proposed. Rats *Rattus rattus* and feral cats are proven threats to the survival of the colonies, and feral goats cause degradation of soil and vegetation near the colonies and may reach the colonies themselves.

#### Further reading

Anon. (1998), Barré (1988), Bretagnolle and Attié (1991), Cadet (1980), Cheke (1987b), Le Corre *et al.* (1996), Jouanin (1963, 1987), Probst and Le Corre (1996), Probst *et al.* (2000).

### Grand Bénard–Tapcal — RE002

**Admin region** Saint-Louis, Saint-Paul
**Coordinates** 21°07'S 55°25'E — A1, A2 (101), A4ii
**Area** 1,500 ha **Altitude** 950–2,896 m — Protected Biotope

#### Site description

The site comprises the peaks, cliffs and ridges radiating from Le Grand Bénard (2,896 m), including parts of the rims of the Cirque de Cilaos and the Cirque de Mafate, together with the western part of the Cirque de Cilaos (Le Tapcal). The spectacular terrain results from erosion of the volcanic Piton des Neiges massif. The summits and ridge-tops are almost devoid of vegetation, but the slopes and ledges support montane shrubland or bushland and thicket characteristic of high altitudes. Le Tapcal is covered with a fine stand of mixed montane forest, although exotics dominate in a few small areas.

### Birds

See Box and Table 2 for key species. The site supports important colonies of two seabird species, including *Pterodroma baraui* (2–3 colonies), for which only one other breeding area (RE001) is known. All of the forest-living endemic birds of La Réunion occur except *Coracina newtoni*. In 1997, 1–3 pairs of *Circus maillardi* were present.

**Key species**

| | | | |
|---|---|---|---|
| A1 | *Pterodroma baraui* | *Collocalia francica* | |
| A2 (101) | Réunion EBA: Six of the seven species of this EBA have been recorded at this site; see Table 2. | | |
| A4ii | | Breeding (pairs) | Non-breeding |
| | *Pterodroma baraui* | 1,000–1,500 | — |
| | *Puffinus lherminieri* | 300+ | — |

### Other threatened/endemic wildlife

Endemic plant communities: forest, shrubland and bushland and thicket rich in endemic plants.

### Conservation issues

Part of the site, along with Le Piton des Neiges (IBA RE001), has been classified under an Arrêté de Protection de Biotope since January 2001, which will regulate intrusive activities. The inaccessibility of the site offers natural protection from people, but the increase in mountaineering and helicopter excursions threatens colonies of *Pterodroma baraui*. However, poaching of seabird chicks and other birds still occurs, and *Rattus rattus*, feral cats and feral goats threaten native wildlife.

### Further reading

Anon (1998), Barré (1988), Bretagnolle and Attié (1991), Cadet (1980), Cheke (1987b), Le Corre *et al.* (1996), Jouanin (1963, 1987), Probst and Le Corre (1996), Probst *et al.* (2000).

## Plaine des Chicots–Plaine d'Affouches — RE003

**Admin region** Saint-Denis
**Coordinates** 20°58′S 55°27′E — A1, A2 (101), A4ii
**Area** 3,688 ha **Altitude** 410–2,277 m — Nature Reserve

### Site description

Situated in mountains to the north of La Réunion, the site is a plain sloping from the northern rim of the Cirque de Mafate northwards towards the town of Saint-Denis. A deep gorge formed by the Rivière Saint-Denis cuts into this plain, separating the Plaine des Chicots in the east from the Plaine d'Affouches in the west. The lower half (1,000–1,550 m) is covered by mixed montane forest, which is gradually replaced at higher altitude by forest dominated by the endemic *Acacia heterophylla* ('tamarin des hauts'). Above 1,600 m, montane shrubland or bushland and thicket dominates, becoming very sparse near the summit of La Roche Ecrite (2,277 m). The trail across the Plaine des Chicots to La Roche Ecrite is much used for recreation. For many years the site has been stocked with exotic deer *Cervus timorensis* for hunting, and lower parts abutting the site (to the south) used for plantations of the exotic conifer *Cryptomeria japonica*.

### Birds

See Box and Table 2 for key species. The site is the only breeding area for *Coracina newtoni* (entire known population, 120–150 pairs) and supports populations of all the other native, forest-living birds of La Réunion, together with important colonies of *Puffinus lherminieri*. Up to five pairs of *Circus maillardi* were present in 1998.

**Key species**

| | | | |
|---|---|---|---|
| A1 | *Collocalia francica* | *Coracina newtoni* | |
| A2 (101) | Réunion EBA: All of the seven species of this EBA have been recorded at this site; see Table 2. | | |
| A4ii | | Breeding (pairs) | Non-breeding |
| | *Puffinus lherminieri* | Probably 300+ | — |

### Other threatened/endemic wildlife

Endemic plant communities: rich forest with many endemic plants. Lepidoptera: several endemic moth species. Reptiles: *Phelsuma borbonica* (endemic).

### Conservation issues

Alongside the ubiquitous threats associated with fire and exotic plant and animal species invasion, current threats of particular importance at this site are 'traditional' liming of forest passerines, and destruction of undergrowth (including native seedlings) by *Cervus timorensis*. The whole site was classified as a Nature Reserve in December 1999, and a management plan is being developed under the auspices of the ONF and Direction Régionale de l'Environnement de la Réunion. This will largely remove the threat from poaching, allow reduction in *Cervus timorensis* numbers, and provide for continuing monitoring (in progress since 1993) of the *Coracina newtoni* population. *Cryptomeria* has not been planted since the early 1980s and no further planting is planned.

### Further reading

Anon. (1997), Anon. (1998), Attié (1994), Barré *et al.* (1996), Barré (1988), Cadet (1980), Cheke (1987b), Guillermet and Guillermet (1986), Probst (1993), Thiollay and Probst (1999).

## Mouth of the Cirque de Salazie — RE004

**Admin region** Bras Panon, Salazie
**Coordinates** 21°00′S 55°35′E — A1, A2 (101), A4ii
**Area** 1,780 ha **Altitude** 160–1,430 m — Unprotected

### Site description

The site covers the gorges of the Rivière du Mat and the Bras de Caverne, together with associated plateau areas from 160 m to 1,430 m. The Rivière du Mat drains the Cirque de Salazie, leaving it through a gorge a few hundred metres across. The Bras de Caverne drains the Bélouve plateau, above and south-east of the same cirque, and flows into the Rivière du Mat close to the narrowest point of the gorge. The tall cliffs resulting from powerful erosion are partly covered with well-preserved stands of mixed moist evergreen lowland forest; extensive scree and bare rock also occur. The floor of the gorge contains the riverbed, a road and a few habitations and cultivated areas.

### Birds

See Box and Table 2 for key species. The site is particularly important for *Puffinus lherminieri* (about 10 colonies), *Circus maillardi* (8–12 pairs in 1998) and *Collocalia francica* (probably several colonies), but also supports a typical community of native, forest-living birds.

**Key species**

| | | | |
|---|---|---|---|
| A1 | *Circus maillardi* | *Collocalia francica* | |
| A2 (101) | Réunion EBA: Six of the seven species of this EBA have been recorded at this site; see Table 2. | | |
| A4ii | | Breeding (pairs) | Non-breeding |
| | *Puffinus lherminieri* | 300+ | — |

### Other threatened/endemic wildlife

Endemic plant communities: wide diversity of native plants.

### Conservation issues

The precipitous terrain provides natural protection to this site, and site-specific threats are minimal, mainly relating to expansion of agriculture in the flatter lowland areas.

### Further reading

Anon. (1998), Barré (1988), Barré *et al.* (1996), Bretagnolle *et al.* (2000), Cadet (1980), Cheke (1987b), Clouet (1978), Dupont *et al.* (1989), Ghestemme *et al.* (1998), Guillermet and Guillermet (1986).

## Rivière des Marsouins–Grand Etang — RE005

**Admin region** Saint-Benoit
**Coordinates** 21°40′S 55°38′E — A1, A2 (101), A4ii
**Area** 1,800 ha **Altitude** 83–1,334 m — Unprotected

### Site description

This is a mid-altitude site that includes the steep-sided ravine of the Rivière des Marsouins, together with a lake (Le Grand Etang) created by the blockage of a valley by a lava-flow from Le Piton de la Fournaise

volcano. The ravine cuts into the Bébour plateau, a forested area due west of Le Piton des Neiges, at the Caverne des Hirondelles (at 1,334 m). The site extends from this point down the river to the lowlands at 83 m, and also over the ridge to the south to include Le Grand Etang and its surroundings. Most of the site is remarkably unaltered ecologically, with extensive, rich native plant communities, especially mixed moist evergreen lowland forest; a few stands of exotic vegetation are present. The lake covers about 30 ha. No land-uses are known, although the lake and part of the ravine are accessible by road or track.

### Birds

See Box and Table 2 for key species. The site is particularly important for *Puffinus lherminieri* (common breeding visitor), *Circus maillardi* (8–12 pairs in 1998) and *Collocalia francica* (several colonies known), but also supports a typical community of native, forest-living birds, most at notably high densities.

**Key species**

| | | | |
|---|---|---|---|
| A1 | *Circus maillardi* | *Collocalia francica* | |
| A2 (101) | Réunion EBA: Six of the seven species of this EBA have been recorded at this site; see Table 2. | | |
| A4ii | | Breeding (pairs) | Non-breeding |
| | *Puffinus lherminieri* | 300+ | — |

### Other threatened/endemic wildlife

Endemic plant communities: wide diversity of native plant species.

### Conservation issues

The precipitous terrain provides natural protection to this site, and no site-specific threats are known.

### Further reading

Anon. (1998), Barré (1988), Barré *et al.* (1996), Cadet (1980), Cheke (1987b), Clouet (1978), Dupont *et al.* (1989), Ghestemme *et al.* (1998), Guillermet and Guillermet (1986).

## Grand Bassin–Le Dimitile — RE006

**Admin region** Entre-Deux, Le Tampon
**Coordinates** 21°10′S 55°30′E — A1, A2 (101), A4ii
**Area** 3,000 ha **Altitude** 550–2,350 m — Unprotected

### Site description

Grand Bassin–Le Dimitile is on the southern slopes of the volcanic Piton des Neiges massif, which are now separated from the summit by the Cirque de Cilaos and consist of a south-facing escarpment incised by eight small ravines. The site extends from the south-east rim of the Cirque de Cilaos (Sommet de l'Entre-Deux, 2,350 m) down to around 550 m on the slopes above the Bras de la Plaine river near La Commune d'Entre-Deux. Most vegetation is mixed montane forest; small areas of bare rock, scree, montane shrubland or bushland and thicket are found in the higher parts, and deforested areas with exotic vegetation (including some cultivation) occur lower down.

### Birds

See Box and Table 2 for key species. The site is one of the most likely to hold breeding *Pterodroma aterrima*, based on the fact that seven specimens have been found nearby (five recently), and some descriptions of seabirds by local people may refer to this species. *Pterodroma baraui* may also breed at high altitude. All of the forest-living native birds of La Réunion occur, except *Coracina newtoni*, along with an important population of *Puffinus lherminieri*. In 1997, 3–5 pairs of *Circus maillardi* were present.

**Key species**

| | | | |
|---|---|---|---|
| A1 | *Pterodroma aterrima* | *Collocalia francica* | |
| A2 (101) | Réunion EBA: Six of the seven species of this EBA occur at this site; see Table 2. | | |
| A4ii | | Breeding (pairs) | Non-breeding |
| | *Puffinus lherminieri* | 300+ | — |

### Other threatened/endemic wildlife

Endemic plant communities: forest, shrubland and bushland and thicket rich in endemic plants.

### Conservation issues

No conservation projects are known. The cliffs are naturally well protected, but clearance of the forest, especially the privately-owned Forêt du Dimitile, is not controlled, and fire may be a particular threat at this site. Further searches for *Pterodroma aterrima* are very much needed.

### Further reading

Anon. (1998), Attié *et al.* (1998), Barré (1988), Cadet (1980), Le Corre and Gerdil (in prep.), Jouanin (1987).

## Rivière des Remparts–Rivière Langevin — RE007

**Admin region** Saint-Joseph
**Coordinates** 21°15′S 55°39′E — A1, A2 (101), A4ii
**Area** 7,000 ha **Altitude** 100–2,320 m — Unprotected

### Site description

The site comprises two extremely steep-sided ravines in the south of the island, separated by a narrow, cultivated plateau and an uncultivated ridge. The riverbeds are affected by floods and landslides, and support a few habitations and cultivated areas, but the ramparts are unaltered. The site includes lowland and montane habitats (100–2,320 m), including mixed moist evergreen lowland forest, mixed montane forest, and montane shrubland, bushland and thicket. The most exposed, steep cliffs are bare rock.

### Birds

See Box and Table 2 for key species. Rivière des Remparts supports the highest density of *Puffinus lherminieri* colonies known on La Réunion, and also a high density of *Circus maillardi* (10–15 pairs in 1997). All the other forest-living native birds of La Réunion occur, except *Coracina newtoni*. Historical accounts describe petrels *Pterodroma* sp. nesting in the upper part of the site; none have been found recently, but they may nevertheless occur.

**Key species**

| | | | |
|---|---|---|---|
| A1 | *Circus maillardi* | *Collocalia francica* | |
| A2 (101) | Réunion EBA: Six of the seven species of this EBA have been recorded at this site; see Table 2. | | |
| A4ii | | Breeding (pairs) | Non-breeding |
| | *Puffinus lherminieri* | 300+ | — |

### Other threatened/endemic wildlife

There is a wide diversity of native plant communities.

### Conservation issues

Fires have destroyed a large part of the vegetation of the western part of the Rivières des Remparts above 1,700 m. No other specific threats have been identified.

### Further reading

Anon. (1998), Barré (1988), Barré *et al.* (1996), Cadet (1980), Cheke (1987b), Clouet (1978), Dupont *et al.* (1989), Ghestemme *et al.* (1998), Guillermet and Guillermet (1986).

## Ravine de la Grande Chaloupe — RE008

**Admin region** Saint-Denis, La Possession
**Coordinates** 20°54′S 55°23′E — A1, A2 (101)
**Area** 825 ha — Protected (designation as yet undecided)
**Altitude** 0–800 m

### Site description

The site comprises a steep-sided valley in the dry, north-western lowlands between St-Denis and La Possession, together with the lowest part of the Ravine à Jacques, 1 km to the north-east. It contains a few habitations at the river mouths, a tourist centre and a military firing range, but around 40% of the site is protected, as it is one of the last sites on La Réunion where dry evergreen lowland forest survives. Other major habitats are secondary grassland and exotic thickets; small areas of cliff and rocky shore also occur.

## Birds

See Box and Table 2 for key species. The site supports a high density of breeding *Circus maillardi* (5–10 pairs in 1997) and two of the largest known colonies of *Collocalia francica* (at least two large colonies totalling c.1,000 pairs in 1998) and all the other forest-living native birds of La Réunion except *Coracina newtoni.* Up to 100 pairs each of three seabird species (*Puffinus pacificus*, *P. lherminieri* and *Phaethon lepturus*) nest, but their populations are not globally significant.

**Key species**

| | | |
|---|---|---|
| A1 | *Circus maillardi* | *Collocalia francica* |
| A2 (101) | Réunion EBA: Six of the seven species of this EBA have been recorded at this site; see Table 2. | |

## Other threatened/endemic wildlife

Dry evergreen lowland forest is the most threatened vegetation-type on the island, and supports many endemic plants.

## Conservation issues

The conservation value of the site is recognized by several authorities. In 1998, nearly half (354 ha) of the site had been acquired for conservation purposes by Le Conservatoire du Littoral (257 ha) or the Département (as an Espace Natural Sensible covering 97 ha), while the Direction Régionale de l'Environnement de la Réunion and ONF were preparing a management plan taking account of conservation and touristic values. However, the most appropriate long-term conservation strategy for the site has yet to be finalized; designation as a Nature Reserve would be justified. The main threats are fire and the effects of plant and animal introductions, including grazing by goats.

## Further reading

Barré (1988), Barré *et al.* (1996), Cadet (1980), Cheke (1987b), Clouet (1978), Dupont *et al.* (1989), Ghestemme *et al.* (1998), Guillermet and Guillermet (1986).

## Tromelin — RE009

**Admin region** Iles Eparses
**Coordinates** 15°33′S 54°31′E — A4ii
**Area** 100 ha **Altitude** 0–7 m — Nature Reserve

## Site description

The site is a remote islet in the western Indian Ocean, roughly 480 km north-north-west of Mauritius and 390 km east of the Masoala Peninsula, Madagascar. The islet is low, flat and coralline. The native vegetation is in good condition, composed of *Tournefortia argentea* thicket and 3–5 species of herb. The island is an unmanned Nature Reserve, but has a meteorological station with four permanent staff. It is frequently affected by cyclones.

## Birds

Two seabird species nest, both boobies (Sulidae). During 1993–1996, 200–250 pairs of *Sula dactylatra* nested (with up to 700 birds present, and increasing), alongside 130–180 pairs of *S. sula* (up to 500 present, declining). These populations comprise less than 1% of the global populations, but the site is considered to be an Important Bird Area for the following reasons: first, Sulidae populations in the western Indian Ocean have declined seriously and these are among the healthiest in existence; second, *S. dactylatra* is represented in the western Indian Ocean by an endemic race (*S. d. melanops*), of which Tromelin is one of the strongholds; and third, the *S. sula* population at Tromelin is the only polymorphic one in the region, indicating uniqueness and biogeographical isolation. *Fregata ariel* became extinct before 1968 and *F. minor* in the early 1980s, but up to 120 *Fregata* spp. use the island for roosting. Resident landbirds are absent.

## Other threatened/endemic wildlife

The islet is a nesting site for the sea-turtle *Chelonia mydas* (EN).

## Conservation issues

The islet was made a Nature Reserve in 1975. Classification as a Strict Nature Reserve by Arrêté Ministériel is needed to improve the site's protection (see 'Conservation infrastructure and protected-area system'). Tromelin is an important research site. Human disturbance to the seabird colony is minimal. *Rattus norvegicus* have been abundant and are a limiting factor to seabird populations, but are controlled periodically (although never eradicated) by poisoning.

## Further reading

Barré and Servan (1988), Brooke (1981), Brygoo (1955), Le Corre (1996a, 1999), Le Corre and Jouventin (1997a), Paulian (1955), Staub (1970).

## Ile du Lys, Glorieuses Archipelago — RE010

**Admin region** Iles Eparses
**Coordinates** 11°29′S 47°23′E — A4i, A4iii
**Area** 60 ha **Altitude** 0–15 m — Nature Reserve

## Site description

The site comprises the smaller of the two islands of the Glorieuses Archipelago, which lie in the north of the Mozambique Channel, almost equidistant from Mayotte, Aldabra and Madagascar, but 180 km west of the northernmost tip of the latter. The larger island, Grande Glorieuse, is highly degraded and of little ornithological interest. Ile du Lys is a low (up to 15 m) coral islet 10 km north-east of Grande Glorieuse. The two are connected by sandbanks that are exposed at low tide. The vegetation is patchy evergreen bushland and thicket covering around 30% of the islet.

## Birds

See Box for key species. Ile du Lys supports a very large colony of *Sterna fuscata*, in addition to a small population (around 100 pairs in 1994) of nesting *Anous stolidus*. No landbirds occur. In 1996, Grande Glorieuse held seven landbird species, with no endemic species or subspecies. In the past, eight additional seabird species bred there.

**Key species**

| | | | |
|---|---|---|---|
| A4i | | Breeding (pairs) | Non-breeding |
| | *Sterna fuscata* | 100,000 | — |
| A4iii | More than 100,000 pairs of seabird nest at this site. | | |

## Other threatened/endemic wildlife

The islet is a nesting site for the sea-turtle *Chelonia mydas* (EN).

## Conservation issues

The islet was made a Nature Reserve in 1975. Classification as a Strict Nature Reserve (by Arrêté Ministériel) is needed to improve the site's protection (see 'Conservation infrastructure and protected-area system'). Rats (probably *Rattus norvegicus*) are abundant and may limit seabird populations. Illegal landing by sailors and tourists is less frequent than in the past, but still causes occasional disturbance to the seabird colony.

## Further reading

Barré and Servan (1988), Benson *et al.* (1975), Le Corre (1996b), Guyon (1994a), van der Elst and Prys-Jones (1987).

## Juan de Nova — RE011

**Admin region** Iles Eparses
**Coordinates** 17°03′S 42°42′E — A4i, A4iii
**Area** 850 ha **Altitude** 0–15 m — Unprotected

## Site description

The site is a coral island in the central Mozambique Channel, lying around 200 km west-south-west of Cap Saint André, Madagascar. Its ecosystems were severely degraded by human settlement for guano extraction until 1972. Only two naturalists have visited the site since the 1950s, but the vegetation is believed to be low shrubland. The island is used by the military, and also supports a meteorological station.

## Birds

See Box for key species. Juan de Nova supports a very large colony of *Sterna fuscata*, in addition to a small population (at least 50 pairs in 1994) of nesting *S. bergii*. At least seven landbird species occur, most probably introduced.

| Key species | | | |
|---|---|---|---|
| A4i | | Breeding (pairs) | Non-breeding |
| | *Sterna fuscata* | 100,000 | — |
| A4iii | More than 100,000 pairs of seabird nest at this site. | | |

## Other threatened/endemic wildlife

The islet is a nesting site for the sea-turtle *Chelonia mydas* (EN).

## Conservation issues

Unlike the other Iles Eparses, this site was not made a Nature Reserve in the 1970s, because of political factors operating at the time, and it remains unprotected. Threats have not been studied in detail. However, by analogy with other islands in the region, disturbance to the seabird colony, and the impacts of exotic mammals, are likely to be problems. Predation of seabirds by cats has recently been confirmed, and *Rattus* sp. and *Mus musculus* are both present.

## Further reading

Barré and Servan (1988), Guyon (1994b), Seitre (1997).

## Europa — RE012

**Admin region** Iles Eparses
**Coordinates** 22°20′S 40°22′E — A1, A4i, A4ii, A4iii
**Area** 3,000 ha **Altitude** 0–12 m — Nature Reserve

## Site description

Europa is an island in the southern Mozambique Channel, 350 km west-south-west of Morombe, Madagascar. It is one of the least modified coralline islands in the western Indian Ocean and was formed from the progressive filling of an ancient atoll which appeared 90,000 years ago. It is composed of a central lagoon largely surrounded by mangrove *Rhizophora mucronata*; shrubland, bushland and thicket, dominated by *Psiadia altissima*, *Suriana maritima* and/or *Pemphis acidula*; *Euphorbia stenoclada* dry forest; *Sclerodactylon macrostachyum* grassland; halophile vegetation (*Arthrocnemum indicum*) and a fringing beach- and dune-system rising to 12 m, the highest land on the island. In all, 33–46 angiosperm species occur. Eighteen people live on the island in shifts of 45 days; three occupy a meteorological station, and 15 are military servicemen.

## Birds

See Box for key species. Europa holds a diverse and very large population of breeding seabirds, with five species occurring in globally significant numbers, and it is also the only known breeding site outside Madagascar and Aldabra for the globally near-threatened *Ardeola idae* (up to 15 pairs in 1996). Additional nesting waterbird and seabird species are *Fregata minor* (700–1,100 pairs; the second largest colony in the western Indian Ocean), *Puffinus lherminieri* (50–100 pairs; probably of the subspecies *P. l. bailloni*, previously thought to be endemic to the Mascarene Islands), *Egretta dimorpha* (abundant breeding resident) and *Sterna caspia* (10–15 pairs). The seabird community appears to be biogeographically isolated from others in the region as it shows several unique features, including the presence of an endemic subspecies, *Phaethon lepturus europae*. Three landbird species are present, of which one, the abundant *Zosterops maderaspatanus voeltzkowi*, is an endemic subspecies. A wide range of migrant and vagrant species have been recorded.

| Key species | | | |
|---|---|---|---|
| A1 | *Ardeola idae* | | |
| A4i | | Breeding (pairs) | Non-breeding |
| | *Sterna fuscata* | 500,000–1,000,000 | — |
| A4ii | *Fregata ariel* | 1,000–1,200 | — |
| | *Phaethon rubricauda* | 3,000–4,000 | — |
| | *Phaethon lepturus* | 500–1,000 | — |
| | *Sula sula* | 2,800–3,800 | — |
| A4iii | More than 500,000 pairs of seabird nest at this site. | | |

## Other threatened/endemic wildlife

The island is a nesting site for the sea-turtle *Chelonia mydas* (EN), and *Eretmochelys imbricata* (CR) and *Caretta caretta* (EN) are also present. There are two endemic lizard subspecies (*Mabuya comorensis infralineata* and *Cryptoblepharus boutonii bitaeniatus*). Overall, the coral island ecosystem is one of the finest in the Indian Ocean.

## Conservation issues

Europa has received little attention from the scientific or conservation communities, yet it seems hardly more damaged than the much more famous Aldabra atoll (Seychelles). It was made a Nature Reserve in 1975. Classification as a Strict Nature Reserve by Arrêté Ministériel is needed to improve the site's protection (see 'Conservation infrastructure and protected-area system'). Seabirds suffer from predation by introduced *Rattus rattus* and by two landbirds *Tyto alba* and *Corvus albus*, which are probably native, but which have populations maintained at high levels by human and exotic rodent populations. Further threats to native ecosystems are browsing by introduced goats *Capra hircus* (which number over 300), invasion by exotic plants (*Agave sisalana* and *Furcraea foetida* are already present, others may arrive) and animals (further introductions are a danger), fires and occasional human disturbance. To date, conservation activities include experimental eradication of *Rattus rattus* from a small islet to test the effect on seabird nesting success, control of *Corvus albus*, waste control, and monitoring of vegetation and seabird distributions.

## Further reading

Barré and Servan (1988), Le Corre (1994, 1995, 1999, 2000), Le Corre and Jouventin (1997b, 1999), Le Corre and Probst 1997).

# BIBLIOGRAPHY


Anon. (1997) Reserve naturelle de la Roche Ecrite. Dossier de présentation au Conseil National de Protection de la Nature. Saint-Denis, La Réunion: Office National des Forêts. (Unpubl. report.)

Anon. (1998) Programme d'étude et de conservation des oiseaux marins de la Réunion, 1996–1998. Rapport final. Saint-Denis, La Réunion: CEBC-CNRS/DIREN-Réunion/Muséum d'Hostoire Naturelle de la Réunion. (Unpubl. report.)

Attié, M. (1994) Impact du cerf de Java (*Cervus timorensis*) à la Plaine des Chicots et proposition de restauration du milieu. Saint-Denis, La Réunion: Office National des Forêts. (Unpubl. report.)

Attié, C., Stahl, J. C. and Bretagnolle, V. (1998) New data on the endangered Mascarene Petrel *Pseudobulweria aterrima*: a third twentieth century specimen and distribution. *Colonial Waterbirds* 3: 406–412.

Barré, N. (1988) Une avifaune menacée: les oiseaux de la Réunion. Pp. 167–196 in J.-C. Thibault and I. Guyot, eds. *Livre rouge des oiseaux menacés des regions françaises d'outre-mer*. Saint-Cloud, France: Conseil International pour la Protection des Oiseaux (Monogr. 5).

Barré, N. and Servan, J. (1988) L'avifaune des Iles Eparses. Pp. 209–224 in J.-C. Thibault and I. Guyot, eds. *Livre rouge des oiseaux menacés des regions françaises d'outre-mer*. Saint-Cloud, France: Conseil International pour la Protection des Oiseaux (Monogr. 5).

Barré, N., Barau, A. and Jouanin, C. (1996) *Oiseaux de la Réunion*. Paris: Les Editions du Pacifique.

Benson, C. W., Beamish, H. H., Jouanin, C., Salvan, J. and Watson, G. E. (1975) The birds of the Iles Glorieuses. *Atoll Res. Bull*. 176: 1–33.

Bretagnolle, V. and Attié, C. (1991) Status of Barau's Petrel (*Pterodroma barau*i): colony sites, breeding population and taxonomic affinities. *Colonial Waterbirds* 14: 25–33.

Bretagnolle, V., Attié, C. and Pasquet, E. (1998) Cytochrome-B evidence for validity and phylogenetic relationships of *Pseudobulweria* and *Bulweria* (Procellariidae). *Auk* 115: 188–195.

Bretagnolle, V., Ghestemme, T., Thiollay, J.-M. and Attié, C. (2000) Distribution, population size and habitat use of the Réunion Marsh Harrier, *Circus m. maillardi*. *J. Raptor Res*. 34(1): 8-17.

Brooke, E. (1981) Layard's bird-hunting visit to Tromelin or Sandy Island in December 1856. *Atoll. Res. Bull.* 225: 73–82.

Brygoo, E. (1955) Observation sur les oiseaux de Tromelin. *Naturaliste Malgache* 7(2): 209–214.

Cadet, L. J. T. (1980) *La végétation de l'île de la Réunion*. St-Denis, Réunion: Imprimerie Cazal.

Cheke, A. S. (1987a) An ecological history of the Mascarene Islands, with particular reference to extinctions and introductions of land vertebrates. Pp. 5–89 in A. W. Diamond, ed. *Studies of Mascarene island birds*. Cambridge, UK: Cambridge University Press.

Cheke, A. S. (1987b) The ecology of the surviving native landbirds of Réunion. Pp. 301–358 in A. W. Diamond, ed. *Studies of Mascarene island birds*. Cambridge, UK: Cambridge University Press.

Clouet, M. (1978) Le busard de Maillard (*Circus maillardi maillardi*) de l'Ile de la Réunion. *Oiseaux Rev. Franç. Ornithol*. 48: 95–106.

Le Corre, M. (1994) Notes sur les problèmes de conservation rencontrés sur l'île Europa et propositions d'action. Saint-Denis, La Réunion: Muséum d'Histoire Naturelle. (Unpubl. report.)

Le Corre, M. (1995) Contrôle des animaux prédateurs et/ou favorisés par l'action de l'hommes sur l'île Europa. Saint-Denis, La Réunion: Muséum d'Histoire Naturelle. (Unpubl. report.)

Le Corre, M. (1996a) The breeding seabirds of Tromelin Island (western Indian Ocean): population sizes, trends and breeding phenology. *Ostrich* 67: 155–159.

Le Corre, M. (1996b) Vulnérabilité des milieux naturels terrestres de l'archipel des Glorieuses (Iles Eparses, Océan Indien Occidental) et recommandations pour limiter l'impact d'une ouverture touristique de l'archipel. Saint-Denis, La Réunion: Muséum d'Histoire Naturelle. (Unpubl. report.)

Le Corre, M. (1999) Plumage polymorphism of Red-footed Boobies in the western Indian Ocean: an indicator of biogeographic isolation. *J. Zool. Lond.* 249: 411–415.

Le Corre, M. (2000). Taxonomic affinities of Audubon's Shearwater from Europa Island. *Condor* 102: 187–190.

Le Corre, M. and Gerdil, T. (in prep.) Conservation of the endangered Mascarene Black Petrel (*Pseudobulweria aterrima*).

Le Corre, M. and Jouventin, P. (1997a) Kleptoparasitism in tropical seabirds: vulnerability and avoidance responses of a host species, the Red-footed Booby *Sula sula*. *Condor* 99: 162–168.

Le Corre, M. and Jouventin, P. (1997b) Ecological significance and conservation priorities of Europa island (western Indian Ocean), with special reference to seabirds. *Rev. Ecol. (Terre Vie)* 52: 205–220.

Le Corre, M. and Jouventin, P. (1999) Geographic variation in the White-tailed Tropicbird *Phaethon lepturus* with the description of a new subspecies endemic to Europa island, southern Mozambique Channel. *Ibis* 141: 233–239.

Le Corre, M. and Probst, J.-M. (1997) Migrant and vagrant birds of Europa island (southern Mozambique Channel). *Ostrich* 68: 13–18.

Le Corre, M., Probst, J.-M., de Viviès, Y. M. and Ribes, S. (1996) Opération de sauvetage réussie pour les jeunes pétrels de Barau à l'envol. *Courrier de la Nature* 160: 12–13.

Dupont, J., Girard, J.-C. and Guinet, M. (1989) *Flore en détresse*. Saint-Denis, La Réunion.

van der Elst, R. and Prys-Jones, R. P. (1987) Mass killing by rats of roosting common noddies. *Oryx* 21: 219–222.

Ghestemme, T., Portier, E. and Le Corre, M. (1998) Recensement de la population de papangues (*Circus maillardi maillardi*) de La Réunion. Densité et distribution des couples reproducteurs. Saint-Denis, La Réunion: DIREN/SEOR/ENS. (Unpubl. report.)

Guillermet, C. and Guillermet, W. (1986) Contribution à l'étude de papillons hétérocères de l'Ile de la Réunion. Saint-Denis, La Réunion: Sociéte Réunionnaise des Amis du Muséum. (Unpubl. report.)

Guyon, J. (1994a) Archipel des Glorieuses: observation sur les animaux. Mission du 8 novembre au 16 décembre 1994. (Unpubl. report.)

Guyon, J. (1994b) Rapport de mission à Juan de Nova, 20 janvier–16 février 1994. Météo-France. (Unpubl. report.)

Imber, M. (1985). Origins, phylogeny and taxonomy of the gadfly petrels *Pterodroma* spp. *Ibis* 127: 197–229.

Institut Géographique National (1987) *La Réunion*. [Map at 100,000 scale.] Paris: Institut Géographique National.

Jouanin, C. (1963) Un pétrel nouveau de La Réunion: *Bulweria baraui*. *Bull. Mus. Hist. Nat.* 35: 593–597.

Jouanin, C. (1987) Notes on the nesting of Procellariiformes in Réunion. Pp. 359–363 in A. W. Diamond, ed. *Studies of Mascarene island birds*. Cambridge, UK: Cambridge University Press.

Paulian, R. (1955) Observation sur la faune terrestre de l'île Tromelin. *Naturaliste Malgache* 7: 1–7.

Probst, J.-M. (1993) Recherches bibliographiques et études préliminaires sur la densité et la biologie de l'oiseau endémique menacé: *Coracina newtoni*. Saint-Denis, La Réunion. (Unpubl. report.)

Probst, J.-M. (1997) *Animaux de la Réunion*. Saint-Denis, La Réunion: Azalés Editions.

Probst, J.-M. and Le Corre, M. (1996) Dossier scientifique pour le classement en Arrêté de Protection de Biotope des sites de reproduction du Pétrel de Barau (*Pterodroma baraui*), espèce endemique de l'Ile de la Réunion (Océan Indien occidental). Saint-Denis, La Réunion: Muséum d'Histoire Naturelle. (Unpubl. report.)

Probst, J.-M., Colas, P. and Douris, H. (1995) Premières photos d'un site de nidification du pétrel de Barau à l'Ile de la Réunion. *Courrier de la Nature* 150: 16.

Probst, J.-M., Le Corre, M. and Thébaud, C. (2000) Breeding habitat and conservation priorities in *Pterodroma baraui*, an endangered gadfly petrel of the Mascarene archipelago. *Biol. Conserv.* 93: 135–138.

Rivals, P. (1952) *Etudes sur la végétation naturelle de l'île de la Réunion.* Toulouse, France: Douladoure.

Seitre, R. (1997) Visite aux Iles Eparses: compte rendu ornithologique. *News. Working Group on Birds of the Madagascar Region* 7: 3–7.

Simmons, R. (2000). *Harriers of the world*. Oxford, UK: Oxford University Press.

Staub, F. (1970) Biogeography and ecology of Tromelin Island. *Atoll. Res. Bull.* 136: 197–209.

Strahm, W. A. (1993) The conservation and restoration of the flora of Mauritius and Rodrigues. Reading, UK: University of Reading (unpublished PhD thesis).

Thiollay, J.-M. and Probst, J.-M. (1999) Ecology and conservation of a small insular bird population, the Réunion cuckoo-shrike *Coracina newtoni*. *Biol. Conserv*. 87: 191–200.

Viette, P. and Guillermet, C. (1996) Lépidoptères hétérocères de La Réunion. Saint-Denis, La Réunion: Sociéte Réunionnaise des Amis du Muséum. (Unpubl. report.)

Walter, K. S. and Gillett, H. J., eds (1998) *1997 IUCN Red List of threatened plants*. Gland, Switzerland and Cambridge, UK: IUCN.