

World Heritage Sites

Protected
Areas and
World
Heritage



LAGOONS OF NEW CALEDONIA: REEF DIVERSITY AND ASSOCIATED ECOSYSTEMS FRANCE

This marine site has exceptional diversity within a continuum of habitats from tropical Gondwanan mountain forests to a wealth of barrier reefs, atolls and lagoons. The 4,400,000 hectares of coral lagoons and 1,600 kilometres of reef make New Caledonia's system the second most extensive in the world after the Great Barrier Reef, with the world's most diverse concentration of reef structures within an eighth of the area of the Australian site.

COUNTRY

France

NAME

Lagoons of New Caledonia: Reef Diversity and Associated Ecosystems

NATURAL WORLD HERITAGE SERIAL SITE

2008: Inscribed on the World Heritage List under Natural Criteria vii, ix and ix.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The UNESCO World Heritage Committee issued the following Statement of Outstanding Universal Value at the time of inscription:

Values

The tropical lagoons and coral reefs of New Caledonia are an outstanding example of high diversity coral reef ecosystems and form one of the three most extensive reef systems in the world. They are the location for the world's most diverse concentration of reef structures, with an exceptional diversity of coral and fish species and a continuum of habitats from mangroves to seagrasses and a wide range of reef forms, extending over important oceanic gradients. They still display intact ecosystems, with healthy populations of top predators, and a large number and diversity of large fish. They are of exceptional natural beauty, and contain diverse reefs of varying age from living reefs through to ancient fossil reefs, providing an important source of information on the natural history of Oceania.

Criterion (vii): Superlative natural phenomena or natural beauty: The tropical lagoons and coral reefs of New Caledonia are considered to be some of the most beautiful reef systems in the world due to their wide variety of shapes and forms within a comparatively small area. This ranges from extensive double barrier systems, offshore reefs and coral islands, to the near-shore reticulate reef formations in the west coast zone. The richness and diversity of landscapes and coastal backdrops gives a distinctive aesthetic appeal of exceptional quality. This beauty continues below the surface with dramatic displays of coral diversity, massive coral structures, together with arches, caves and major fissures in the reefs.

Criterion (ix): Ongoing biological and ecological processes: The reef complex within this serial property is globally unique in that it is "free-standing" in the ocean and encircles the island of New Caledonia, providing a variety of different kinds of oceanographic exposure, including both warm and cold currents. The coral reef complex has a great diversity of forms including all the major reef types from fringing reefs to atolls, as well as associated ecosystems in both coastal and oceanic situations. Extending over important oceanic gradients, it is one of the planet's best examples of the ecological and biological processes underlying tropical lagoon and coral reef ecosystems, themselves one of the most ancient and complex ecosystem types.

Criterion (x): Biological diversity and threatened species: The property is a marine site of exceptional diversity with a continuum of habitats from mangroves to seagrasses and a wide range of reef forms. The barrier reefs and atolls in New Caledonia form one of the three most extensive reef systems in the world, and together with the reefs of Fiji, are the most significant coral reefs in Oceania. They are the location for the world's most diverse concentration

of reef structures, 146 types based on a global classification system, and they equal or even surpass the much larger Great Barrier Reef in coral and fish diversity. They provide habitat to a number of threatened fish, turtles, and marine mammals, including the third largest population of dugongs in the world.

Integrity

The serial property comprises six marine clusters which are also protected by marine and terrestrial buffer zones that are not part of the inscribed property. It includes all the key areas that are essential for maintaining its natural beauty and the long term conservation of its remarkable reef diversity, and it is of sufficient size to maintain associated biological and ecological processes. The property still displays intact ecosystems with top predators, and a large number and diversity of large fish.

Protection and Management Requirements

The property is currently protected by fisheries legislation, which is being further improved, and co-management arrangements with the Kanak communities are currently being established for all clusters. Management plans are currently being prepared for all clusters with full involvement of stakeholders. Continued efforts to protect and manage the property and its surroundings are required to maintain the present intactness of the coral reef ecosystems. Protecting and managing large areas in the form of no-take zones and proactive management of water quality and fisheries regulations will help maintain reef resilience in the face of climate change. Enhanced surveillance and monitoring are required to address potential impacts from fishing and mining and, to a lesser extent, from agriculture and aquaculture. Tourism is likely to increase in the future and needs to be well planned and managed. Sustainable financing strategies are required to ensure the necessary equipment, human and financial resources for the long term management of the property.

IUCN MANAGEMENT CATEGORY

Unassigned

BIOGEOGRAPHICAL PROVINCE

New Caledonian (5.6.13)

GEOGRAPHICAL LOCATION

Nouvelle-Calédonie and the îles Loyauté to their east lie in the Coral Sea of the southwestern Pacific, 1,700 km west of Queensland and 1,400 km north-northwest of New Zealand. The sites are located between 17°50' to 23°10'S and 162°45' to 167°45'E.

DATES AND HISTORY OF ESTABLISHMENT

1970: *Yves Merlet Réserve Marine Intégrale* created in the north of the Great South Lagoon (IUCN category Ia);

1990s: Several large marine reserves established;

1997: Responsibility for the environment devolved to the three provinces, North, South and Loyalty Islands (except the d'Entrecasteaux atolls, under the central government).

AREA

Marine core area: 1,574,300 ha.

Total buffer area: 1,287,100 ha: marine buffer area: 794,700, terrestrial buffer area: 492,400.

Site	District	Comm- unes (ha)	Marine area (ha)	Marine buffer area (ha)	Land area (ha)
1 Grand Lagon Sud (GLS)	Province Sud	3	314,500	313,100	15,800
2 Zone Côtière Ouest (ZCO)	Province Sud	7	48,200	32,500	171,300
3 Zone Côtière Nord et Est (ZCNE)	Province Nord	7	371,400	100,200	284,500
4 Grand Lagon Nord (GLN)	Province Nord	1	635,700	105,700	6,400
5 Atolls d'Entrecasteaux (ADE)	Nouvelle Calédonie	1	106,800	216,800	0
6 Atoll d'Ouvéa et Beautemps- Beaupré (AOBB)	Province îles Loyauté	1	97,700	26,400	14,400
Totals			1,574,300	794,700	492,400

LAND TENURE

French state and territorial governments. Administered by provinces with recognition of customary rights.

ALTITUDE

From -100m below reef crest (marine core zone) / -1,000m (marine buffer zone) to 1,628m (Mt.Panié).

PHYSICAL FEATURES

New Caledonia is the southwesternmost of the larger archipelagos of the Pacific and at 19,058 sq.km La Grande Terre is the ocean's third largest island. It parallels the Queensland coast 1,200 km to the west, is 410 km long by 50-70 km wide prolonged by coral reefs, lagoons and islets some 275 km to the northwest and 75 km to the southeast, forming an archipelago some 760 km long. It has a backbone of mountains five of which rise above 1,500m. 110 km to the northeast, the Loyalty Islands form a parallel far more scattered chain of small islands of almost the same length between its most distant points. Grande Terre is a remnant of Gondwanaland on the edge of the Australian plate which separated from Australia 85 million years ago and it has remained isolated for 55 million years. It formed above Oligocene and Eocene subductions of the Australian tectonic plate beneath the Pacific plate to become the New Caledonia Ridge. Its geology is complex. In each epoch the subduction was blocked, resulting *circa* 44 Ma, in overlapping (obduction) by a basaltic nappe of ultramafic peridotite mantle rock; and *circa* 34 Ma in overlapping by a nappe of ophiolite (an assemblage largely of basalt, gabbro and serpentinised peridotite). The bedrock is mantled by laterite in the south, by blue schist in the northeast and by basalt and sedimentary rocks in the west. There are rich mineral deposits which include 25% of the known global reserves of nickel. The island has experienced both submergence and emergence: 20,000 years ago the sea level was 120m lower and river canyons then cut now form deep water passes through the reef.

With 1,600 km of barrier reef surrounding la Grande Terre plus the d'Entrecasteaux and Loyalty Island atolls, the archipelago's reefs at 1,574,300 ha in area, are the second most extensive in the world and form the world's most diverse assemblage of reef structures in one location. 60% of the archipelago's surface is formed of fringing reefs, single barrier reefs, double barrier reefs (which are rare), lagoon-enclosing atolls, raised atolls, sand cays, oceanic banks and coral islets. Within each of nine major types of coral, the nomination lists 146 geomorphological sub-units such as reef fronts, slopes and lagoon basins soft and hard bottomed. The reefs and lagoons of the steep eastern windward side of the mainland which average 40m deep and 4-5 km wide and where the reef drops off steeply, differ markedly from those on the shallowly sloping and dry western side in the lee of the mountains which are shallower, more continuous, often wider and in many places lined by fringing reef and mangroves.

The huge Great South Lagoon extends 60 km from the shore in a very varied coral complex covered by islets. The northeast mainland has the greater biodiversity, and less development. The 50 x 70 km Great North Lagoon containing the tiny Belep islands, is very open and important for its birds. It is separated from the d'Entrecasteaux atolls by a 40 km channel. The atolls of the Loyalty Islands are built up as fringing reefs around raised limestone or sea mounts of volcanic origin. They are also underlain by a perched lens of fresh water which has created karstic erosion of caves and potholes, and their chalk cliffs are the remains of old raised atolls. Ultramafic soils cover a third of the main island and with the serpentine soils are nutrient poor but unusually rich in elements such as chromium and manganese. Lagoonal basins have a variety of substrates derived from terrestrial sediments nearer the coast or from degraded coral and shells further out, providing a soft muddy bottom, coral sands, or a mixture of the two. The system therefore hosts an exceptional diversity of landforms, corals and their associated ecosystems, both continental and oceanic in character containing some 10,400 marine and 4,600 terrestrial species, many of them endemic and rare.

CLIMATE

The sites extend over five degrees of latitude, from warm temperate to subtropical. The seasons alternate between wet, with tropical storms and heavy rains from December to April and a fresh wet season from July to September, and dry months in between. The annual rainfall is about 2,000mm on the east coast, increasing with altitude to 4,000mm, and 1,200mm on the rainshadowed west coast, falling in some years to 250mm, in an almost Mediterranean pattern. The Loyalty Islands average 1,500mm. Prevailing trade winds from the east-southeast dominate swells within the lagoons and drop rain on the eastern side of the mountains. Between 1851 and 1951, there were 29 cyclones at irregular intervals and in 2003 Cyclone Erica destroyed 10-80% of live coral cover (Wilkinson, 2004). There is

slight seasonal variation in temperature. At the capital, Nouméa, the December minimum and maximum are 21°C to 37°C; in August these drop to 16°C to 29°C. Sea temperatures average 24°C, but the reefs suffered bleaching in 1997, 2000 and 2002. The waters have a pH of 8.6 and a 90% oxygen saturation. Ocean currents from the southeast may have tempered water temperatures during periods of greater coral bleaching elsewhere.

VEGETATION

The unusual metal-rich soils support about 3,270 species of vascular plants of which 2,430 (74.4%) are endemic, in 108 endemic genera (CI, 2006). This compares with 89% endemism in Hawaii and 83% for New Zealand. The island's Gondwanan origins are evident in the world's largest number and diversity of conifers for its area despite the subtropical location, 43 gymnosperms out of 44 being endemic. Araucaria and podocarp families predominate. There are five endemic angiosperm families and *Amborella trichopoda*, a large understorey shrub considered the most primitive of all flowering plants. The 2006 IUCN Red List of Threatened Species lists some 65 plants as endangered and 27 plants as critically endangered. The submarine life is less sampled and totals there may be underestimated.

There are five main terrestrial habitats. The most extensive is evergreen wet tropical lowland forest (400,000 ha, now covering a fifth of its original extent) with 2,012 species of which 82.2% are endemic; 260 fern species flourish there. Other main vegetation types are the very fragmented sclerophyllous forest on the west of the island below 300m (4,500 ha: 1% of its original extent), with 456 species, 57.5% endemic, and 60 species found only there; low to mid level maquis (440,000 ha) with 1,144 species, 89% endemic, high altitude wet maquis forest of edaphic origin (10,000 ha), with 200 species and over 91% endemics; also anthropogenic savanna (600,000 ha) and marsh (CI, 2006). 13 out of the 19 species of *Araucaria* grow on the ultramafic soils of the wet maquis, including *Araucaria nemorosa* (CR) and the narrow columnar pine *A. columnaris*. There are many species of *Pandanus*, 37 endemic species of palm from 16 endemic genera, including the last 30 trees of *Lavoixia macrocarpa* (CR), 26 other species listed as critically endangered, a primitive genus, Winteraceae and a recent re-discovery, *Captaincookia margareta* (CR) (Lamoureux, 2001a).

Along 50% of the coast, principally on the west side, mangroves of 16 species cover 27,000 ha. The nine main forms of reef contain a wealth of habitats: reef fronts, slopes, passes, terraces and pinnacles, lagoon basins muddy, sandy, platy, rocky, and combinations of these at various levels. The marine vegetation are seagrasses and algal beds. 12 species of seagrasses are found, mainly on the muddy sands of shallow lagoons and inlets: *Cymodocea* spp. predominant in the north, *Thalassia* spp. in the south. 322 species from 46 families of algae are recorded, but it is estimated that 1,000 species may exist. Except for the large number of yet undescribed shallow-water red algae, these grow usually between 15-25m. *Caulerpa*, *Halimeda*, *Avrainvillea* and *Utodea* species are found growing on soft bottoms, blue-green algae, *Sargassum* and *Homophysa* spp. on hard bottoms covered by sediment. Near the île des Pins in the extreme south some resemble temperate species.

FAUNA

The great variety of habitats, particularly marine habitats, the latitudinal and altitudinal ranges, the temperature, salinity and sedimentation gradients between east and west coasts and upwelling currents all contribute to an estimated total of some 15,000 animal species of which about 4,300 are terrestrial. As the archipelago is near to the global centre of coral reef biodiversity, the diversity of reefs and habitats is high and sustains a very wide range of life. Recorded species number 5,055*: fish 1,695 species in 199 families, crustaceans 841, molluscs 802, cnidarians (corals, jellyfish) 900, worms 203, echinoderms 254, alcidians (sea squirts) 220, sponges 151, marine mammals 22, sea snakes 14 and turtles 4. The recorded invertebrate populations are estimated to be 30-40% of those actually present. There are over 70 species of butterfly and 300 moths. Further research may double many of these totals. *(Figures given in the World Atlas of Coral Reefs (2001) include: total marine species 5,980, fish 1,950, molluscs 5,500, crustaceans 5,000, sponges 600, corals 510, endemism 5%.)

In 2004 live coral cover averaged 27.5% (range 6%-75%), though non-living substrates were dominant where sampled (Wilkinson, 2004). The nomination notes that 320 species of hard coral were found in some 1,000 samplings while 40,000 samplings on the Great Barrier Reef found no more than 400 species. However, its 2,340,000 ha of lagoons is less than 7% of the area of the Great Barrier Reef site. The fish are found in three main areas: the reefs, estuaries and mangrove swamps and soft bottomed bays and lagoons. Emblematic species are the giant Malabar and Queensland groupers *Epinephelus malabaricus* and *E. lanceolatus* (VU) and humphead wrasse *Cheilinus undulatus* (EN);

also black-spotted stingray *Taeniura meyeri* (VU), porcupine ray *Urogymnus asperrimus* (VU), estuary seahorse *Hippocampus kuda* (VU) and big-eye tuna *Thunnus obesus* (VU). Several sharks are in the threatened category: New Caledonia catshark *Aulohalaelurus kanakorum* (VU), great white *Carcharodon carcharias* (VU), oceanic white-tip, *Carcharhinus longimanus* (VU), grey reef *C. amblyrhynchus*, tawny nurse *Nebrius ferrugineus* (VU), whale shark *Rhincodon typus* (VU) and leopard shark *Stegostoma fasciatum* (VU). Species new to science are still being discovered. There are also 85 species of freshwater fish according to C.I. in 2006. Less than a third of the very diverse group of crustaceans has been described. (37 freshwater macro-crustaceans are recorded, 15 endemic - CI, 2006.) Molluscs are abundant, especially around the atolls. Emblematic species are the trumpet triton *Charonia tritonis* and the bellybutton nautilus *Nautilus macromphalus*; they also include giant and southern giant clams *Tridacna gigas* (VU) and *T. derasa* (VU). A recent expedition discovered over 2,700 species at one site alone, and further fieldwork will reveal many more: only 200 species of land snails out of a far larger number have been described. Among the echinoderms are 54 species of sea cucumber and 43 starfish.

Humpback whales *Megaptera novaeangliae* (327 individuals) cruise mainly the south and southeast of the island, breeding especially in the Great South lagoon. Other whales recorded include the blue *Balaenoptera musculus* (EN), sei *B. borealis* (EN), minke *B. acutorostrata*, Antarctic minke *B. bonaerensis*, fin *B. physalis* (EN) and Bryde's *B. edeni*; also the sperm *Physeter macrocephalus* (VU), pygmy sperm *Kogia breviceps* and dwarf sperm whales *Kogia sima*, Blainville's beaked *Mesoplodon densirostris* and Cuvier's beaked whales *Ziphius cavirostris*. Among dolphins are the killer whale *Orcinus orca*, false killer whale *Pseudorca crassidens*, melonheaded whale *Peponocephala electra*, Pacific pilot whale *Globicephala macrorhynchus*, common dolphin *Delphinus delphis*, Risso's *Grampus griseus*, bottlenose *Tursiops truncatus*, Indo-pacific bottlenose *T. aduncus*, bridled *Stenella attenuata* and spinner dolphins *Stenella longirostris*. Dugongs *Dugong dugon* (VU: estimated between 800 and 2,663) is Oceania's largest population and the third largest in the world. It is concentrated along and breeds on the northwest and southwest coasts.

Before western importations, the land had no mammals except for bats of which there are 9 species, 6 endemic or nearly so, including the New Caledonian wattled bat *Chalinolobus neocaledonicus* (EN) and Loyalty bent-wing bat *Miniopterus robustior* (EN), longtailed fruit bat *Notopteris macdonaldi* (VU), New Caledonia long-eared bat *Nyctophilus nebulosus* (CR), ornate flying fox *Pteropus ornatus* (VU) and New Caledonia flying fox *P. vetulus* (VU). There are 70 species of reptile, 62 being endemic. There are three land snakes on the Loyalty Islands, but most reptiles are geckos and skinks, including two giant and two smaller geckoes *Rhacodactylus* spp. and the recently rediscovered Bocourt's eyelid skink *Phoboscincus bocourti* (CI, 2006). Marine turtles include the green *Chelonia mydas* (EN:1,500-2,000 individuals) which breeds on the islands, hawksbill *Eretmochelys imbricata* (CR), occasional olive ridley *Lepidochelys olivacea* (VU) and loggerhead *Caretta caretta* (EN: 200-300). The last forms 10-20% of the Pacific population. The 14 species of sea snakes live mostly in the lagoons, particularly the great North and South lagoons.

New Caledonia is an avian hot spot and Endemic Bird Area with 105 species, 23 being found only in New Caledonia (C.I, 2006). According to the IUCN 2008 Red List of Threatened Species, the land birds under most threat are the endemic New Caledonian owl-nightjar *Aegotheles savesi* (CR), New Caledonian lorikeet *Charmosyna diadema* (CR), New Caledonian rail *Gallirallus lafresnayanus* (CR), horned parakeet *Eunymphicus cornutus* (VU), crow honeyeater *Gymnomyza aubryana* (CR) and the endemic flightless kagu *Rhynochetos jubatus* (EN) which is in a monotypic family; also the Australian bittern *Botaurus poiciloptilus* (EN). Seabirds occur in great numbers: 50% of the global populations of the wedge-tailed shearwater *Puffinus pacificus*, and black noddy *Anous minutus* are found there and some 10% of the world populations of the great frigatebird *Fregata minor*, lesser frigatebird *F. ariel*, Dougall's tern *Sterna dougalli* and black-naped tern *S. sumatrana*. Vulnerable sea birds are the Chatham albatross *Thalassarche eremita* (VU), Campbell albatross *T. impavida* (VU), southern royal albatross *Diomedea epomophora* (VU), white-throated storm-petrel *Nesofregatta fuliginosa* (VU), white-necked petrel *Pterodroma cervicalis* (VU), providence petrel *P. solandri* (VU) and Buller's shearwater *Puffinus bulleri* (VU). Three endemic New Caledonian subspecies are described in the nomination: collared petrel *Pterodroma leucoptera caledonica*, Tahiti petrel *Pseudobulweria rostrata trouessarti* and fairy tern *Sterna nereis exsul* (VU), and two are considered rarities: the Herald petrel *Pterodroma heraldica* and grey noddy *Procelsterna cerulea*.

CONSERVATION VALUE

This is a marine site of exceptional diversity with a continuum of habitats from tropical Gondwanan mountain forests and mangroves to seagrasses and a wide range of reef forms. The Park lies within a Conservation International-designated Hotspot, a WWF Global 200 Eco-region, a WWF/IUCN Centre of Plant Diversity and a BirdLife-designated Endemic Bird Area. This is a marine site of exceptional diversity with a continuum of habitats from tropical Gondwanan mountain forests and mangroves to seagrasses and a wide range of reef forms. The Park lies within a Conservation International-designated Hotspot, a WWF Global 200 Eco-region, a WWF/IUCN Centre of Plant Diversity and a BirdLife-designated Endemic Bird Area.

CULTURAL HERITAGE

The indigenes are a Melanesian people, the Kanaky, who have lived on the island for 3,500 years, augmented 800 years ago by Polynesians. Their relation to their land is central to the culture and they live in tribal clans with exclusive rights to the resources of their own communities preserved by customary systems of protective management. The island's name was given by Cook in 1774. It was taken by France in 1853 and Christian culture imposed. The natives were then moved onto reservations and were until recently marginalized.

LOCAL HUMAN POPULATION

The Kanaks live mainly by farming, hunting and fishing, in traditional villages mostly along the coasts. However, by 1996 Kanaks were only 44.6% of the island's population of 230,100, some 4,000 of them on the Loyalty Islands. European inhabitants totalled 34.5%, and Polynesians 11.8% of the population. The archipelago is still a profitable and wealthy French territory and Nouméa is a rich city. Nickel has been mined since 1875 worked by contract labour from Asia, and since World War II, mined on an industrial scale which is opposed by the local people on the grounds of its damage to the environment. Past racial conflicts have been addressed by accords, and with a new reforming, though still pro-French party, political action is slowly moving towards a more equitable multicultural society.

VISITORS AND VISITOR FACILITIES

In 2006 there were 181,866 tourists; in 2005, 100,651. Last year 50 cruise ships called by Nouméa and the Great South Lagoon, carrying some 80,000 people. The remote sites have few visitors: 2113 in Ouvéa in 2001. A concerted tourism development plan agreed between the three provinces is aiming to establish sustainable tourism and to monitor and promote the industry which contributes 6% of the national income, employs 4,500 people and on the mainland, provides adequate hotels, lodging and campgrounds on the nominated sites. Present recreational activities include sailing, surfing, windsurfing, waterskiing, sea kayaking, river kayaking and canoeing, riding, scuba diving and glass-bottomed boat touring. There are catamaran and air links to the offshore islands.

SCIENTIFIC RESEARCH AND FACILITIES

The reefs have been well studied in the field since 1976. They have recently been mapped and a bathymetric program has revealed great variability in the depth of outer reef slopes. Other studies have covered mangroves, seagrasses, algae, the benthos, molluscs, marine mammals, and turtles, fish, and the many types of coral. In 2005 a regional analysis program, *l'Initiative pour les Récifs Coralliens du Pacifique Sud* (CRISP), was initiated by WWF France with the *Institut de Recherche pour le Développement* (IRD) to protect a network of all the region's natural marine communities, their biodiversity and species, large enough to be sustainable. Future studies will cover geomorphology, benthic invertebrates, mangroves, sea grasses, algae, fish and rare and threatened species. WWF multidisciplinary programs have worked since 1997 with local partners on a sclerophyllous forest conservation program, and also on the less endangered wet forests. BirdLife International began a two-year Important Bird Area assessment in 2005, and Conservation International is supporting local NGOs in protecting land sites.

MANAGEMENT

Authority in the islands derives from the French government, intermediated by the government of the Territory working through the elected Congress, the Economic-Social Council, the Senate of the Kanak people, the provincial assemblies of the three provinces, and local communes which in the countryside are largely Kanak. Mechanisms of agreement between the differing interests to ensure participatory management over land uses such as mining, new development and preservation, are complicated. After recent very public troubles, measures to control the impacts of industrial scale mining are essential. In the past, each clan preserved its lands by customary right in an *Aire de conservation et*

co-gestion and these still have weight: certain plants, animals and places are protected by their sacred or totemic status. Most of the nominated marine sites are governed by customary law based on intimate local ecological knowledge, and rural communes police their own coasts out to 300m from the shore. Beyond that, natural resources in the public domain are governed by provincial authorities to 12 nautical miles from shore. The Territory's government is responsible beyond that limit and thus for the d'Entrecasteaux reefs.

Recently, France has made the conservation needs of the island a priority and international NGOs have become involved. At present only 2.6% of the land area under IUCN categories I to IV is protected by the territorial government, and 83 percent of the territory's threatened plant species do not occur in any protected area. Only half of the existing parks have any restrictions on mining within their boundaries, and the remaining ones are open to mining activities (CI, 2007). But where not affected by mining, the state of conservation of the nominated sites is good due to the low pressure of population, tourism and fishing. All land above sea level except for reefs, cays and banks is buffer zone only. The proposed sites on the mainland are less pristine than the marine sites though the reefs have been affected by bleaching, if less badly than elsewhere worldwide. Under the nomination, much of the 60% of the islands' surface which is coral reef, atolls and lagoons will be designated as a serial unit with terrestrial buffer zones to protect watersheds draining into nominated coral coasts.

A management action plan for 2006-2010 has been developed, which recognises that marine protected areas are inherently multi-use, by WWF, CRISP, local officials, politicians, a multidisciplinary team of scientists and communal representatives working together. Plans already exist at different levels and combinations of authorities to deal with pollution, development and tourism. In 2006 new regulations were also drafted to increase control over the opening and closing of mines to lessen the destructive impacts of erosion and toxic drainage, and to encourage revegetation of degraded sites and the protection of rare flora and fauna. Monitoring is to be set up at 120 stations to measure the health, diversity and cover of the reefs, seagrass and mangrove density and the abundance of fish; also the condition of the lagoons near the Goro mine and near Koumac in the north. An annual seminar coordinated by *l'Initiative Française pour les Recifs Coralliens* (IFRECOR) is planned to better project the outstanding value of New Caledonia's environment to the islanders and the world.

MANAGEMENT CONSTRAINTS

Nickel and gold have long been mined on the island and many of the more than 300 sites continue to release sediments into the sea. Recent high world demand for nickel, especially from China, has prompted the government to grant tax breaks to encourage industrial-scale mining by foreign companies. The government has relied on the mining companies to ensure environmental protection. The huge open-cast nickel-cobalt mine of the now Brazilian INCO Company at Goro-Nickel which uses sulphuric acid leaching to refine the ore, and a coal-fired power station for energy, adjoins the Yves Merlet Special Marine Reserve in the Great South lagoon. Landslides have caused some of the worst erosion in the Pacific, sediments and toxic metals such as manganese have polluted water supplies, destroyed streams and been discharged into the lagoon offshore (CI, 2007).

This incursion onto native land and waters has created opposition from the local people, first put down in the 1980s. An earlier preservationist was assassinated and another was forced out of work, but since 2002 when the government granted another adjoining mining concession at Prony, Kanaks have campaigned to protect the environment by gaining it World Heritage status. Their Rheebeu Nuu organisation blockaded the Goro mine in 2006. The leaders were arrested and cooperation with the protesters was ignored. In fact their labour is little used, since the workers are mainly imported from the Philippines but INCO's labour practices led in 2006 to de-listing of the company from the London FTSE index on the grounds of infringement of human rights and its license was temporarily revoked by the government. However a second world-class deposit of high grade ore at Komambo in the northwest is soon to be developed by the Swiss XStrata Nickel company. The campaign for World Heritage designation therefore has parallels with the situation in the Galapagos Islands, with a similar amount at stake on both sides.

Little less devastating than the destruction at the major mining sites, and as persistent, has been unrestricted logging followed by agricultural development, especially of the dry forest, the world's most threatened forest type (Lamoureaux, 2001), now nearly all cleared for cattle grazing. Other threats are fire, hunting, and introduced livestock, also the Timor deer *Cervus timorensis*, a carnivorous snail *Euglandina rosea*, and the neotropical ant *Weissmannia auropunctata*, a dangerous predator on small

wildlife. There are nearly 800 alien plant species, more than 400 alien invertebrates, and some 35 alien vertebrates established on the islands, out-competing and replacing much of the original vegetation and faunal species. 20% of the reefs have been destroyed by human activity. There is little overfishing except near Nouméa, but artisanal fishermen are now having to fish as far away as the Chesterfield Islands, 700 km west. Another development has been the creation of large shrimp farms in the lagoons. The conflicts caused by these pressures and by Kanak claims for protection of the land, have created difficulties for the establishment of effective protective measures. As an officially developed country, New Caledonia does not qualify for international conservation funding and governmental inaction and lack of funds have limited effective protection in the past.

COMPARISON WITH SIMILAR SITES

The main bases for comparison with similar existing World Heritage reef sites are:

- (vii) the diverse beauty of the coastal and oceanic landscapes, four with a background of forested mountains and undersea, of the relatively healthy corals.
- (viii) 1,600 km of coral reefs covering 800,000 ha in a wide variety of forms, continental and oceanic: fringing, patch, single and double barrier, islets, atolls, raised atolls, sand cays and oceanic banks;
the exceptional Gondwanan geology with mantle rocks and ultramafic soils (in the buffer zones);
- (ix) the wide range of latitudinal, altitudinal, climatic and demersal gradients within a single complex, resulting in a continuum of many ecosystems, habitats and species;
- (x) an exceptional number of uncommon and endemic species due to long isolation, largely in good condition, notably quite wide areas of unbleached coral.

This nominated site parallels the existing Great Barrier Reef, also in the southwest Pacific, in many ways. Its 4,400,000 hectares and 1,600 kilometres of barrier reef and atolls make it the world's second most extensive reef system. But it is also the world's most diverse concentration of reef structures - which are all found within an eighth of the area of the Australian site. In addition, the mainland, though only nominated as the buffer zone, has an outstanding and endangered flora, based on a rare geological substrate, threatened by development and coastal mining. Although, on present evidence, the Great Barrier Reef has vastly more marine invertebrates and the Galapagos vastly more plants, the New Caledonian sites, compared with other existing World Heritage reef sites, have more species of coral, fish, algae and invertebrates, higher endemism, and (counting the buffer zones) more endangered species and as many major ecosystems and vascular plants; also a high number of vertebrate species, marine as well as terrestrial. This may only partly reflect the thoroughness of recent studies. It is only lower in recorded numbers of birds. Its live coral cover averaged 27.5% in 2004 which compares well with many other sites.

STAFF

Between 50 and 70 staff are already in place in the sub-sites. Help is also available from the Institute for Research & Development, the University of New Caledonia, the South Pacific Community, L'Aquarium des Lagons, the Centre for the Environment, Operation Whale, WWF and regional organisations.

BUDGET

Funding for the environment for 2006-2010 is E6,217,100 (US\$35,130,000). About a third of this sum is set aside to deal with mining pollution and about 60% for direct conservation. Over the five year period E548,890 (US\$735,500) will be contributed by CRISP, IFRECOR, PROE and WWF which last has already pledged E400,000 (US\$536,000) for a three year period. BirdLife International and Conservation International are presently funding studies.

LOCAL ADDRESSES

Direction du Service d'Etat de l'Agriculture, de la Forêt et de l'Environnement,
209, rue Auguste Bénégig / Haut Magenta / BP 180 / 98845 Nouméa.

Gouvernement de Nouvelle-Calédonie, Secteur de l'Agriculture et de la Mer,
Artillerie / 8, route des Artifices / BP M2/98849 Nouméa.

Affaires Maritimes - Service de la Marine Marchande et des Pêches Maritimes
2 bis, rue Félix Russeil / BP 36 / 98845 Nouméa.

Province Nord: Hôtel de la province, Direction du Développement Economique et de l'Environnement:

route Territoriale 1 / BP 41 / 98860 Koné.

Province Sud: Hôtel de la province, Direction des Ressources Naturelles- Service de l'Environnement : Artillerie / 9, route des artifices / BP L1 / 98849 Nouméa

Province des Iles Loyauté: Hôtel de la province, Direction de l'Équipement et de l'Aménagement- Service de l'Environnement: BP 50 / 98820 / We / Lifou.

Institut de Recherche pour le Développement,
Anse Vata / 101, promenade Roger Laroque / BP A5 / 98848 Nouméa.

Université de Nouvelle-Calédonie, Laboratoire d'Études des Ressources Vivantes et de l'Environnement Marin 145, Avenue James Cook / BP 4477 / 98847 Nouméa.

REFERENCES

The principal source for the above information was the original nomination for World Heritage status.

Government of New Caledonia. (2006). *Les Lagons de Nouvelle-Calédonie. Diversité Récifale et Écosystèmes Associés*. Nomination dossier. [Contains a bibliography of 200 references]

Conservation International (2007). *Biodiversity Hotspots: New Caledonia*.
http://www.biodiversityscience.org/xp/Hotspots/new_caledonia/biodiversity.xml

IUCN (2008). *The Red List of Threatened Species*. IUCN, Cambridge, U.K.

Lamoureux, J. (2001). *New Caledonia Rain Forests (AA0113)*. WWF Wildworld Report.

----- (2001). *New Caledonia Dry forests (AA0202)*. WWF Wildworld Report.

Spalding, M., Ravilious, C. & Green, E. (2001). *World Atlas of Coral Reefs*. UNEP-WCMC & University of California Press, Berkeley, CA, U.S.A.

Urquhart, S. (2006). *Fear and Mining in the South Pacific*. Guerilla News Network, 11 May.

Wilkinson, C. (ed.) (2004). *Status of Coral Reefs of the World*, Vol.2. Report for the Global Coral Reef Monitoring Network by the Australian Institute for Marine Science.

DATE

July 2007, 7-2008, May 2011.