

## World Heritage Sites

Protected  
Areas and  
World  
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## LORENTZ NATIONAL PARK INDONESIA

*Lorentz National Park is the largest protected area in southeast Asia and one of the world's last great wildernesses. It is the only tropical protected area to incorporate a continuous transect from snowcap to sea, and include wide lowland wetlands. The mountains result from the collision of two continental plates and have a complex geology with glacially sculpted peaks. The lowland is continually being extended by shoreline accretion. The site has the highest biodiversity in New Guinea and a high level of endemism.*

*Threats to the site: road building, associated with forest die-back in the highlands, and increased logging and poaching in the lowlands.*

### COUNTRY

Indonesia

### NAME

Lorentz National Park

### NATURAL WORLD HERITAGE SITE

1999: Inscribed on the World Heritage List under Natural Criteria viii, ix and x.

### STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]

The UNESCO World Heritage Committee issued the following statement at the time of inscription:

#### Justification for Inscription

The site is the largest protected area in Southeast Asia (2.35 mil. ha.) and the only protected area in the world which incorporates a continuous, intact transect from snow cap to tropical marine environment, including extensive lowland wetlands. Located at the meeting point of two colliding continental plates, the area has a complex geology with on-going mountain formation as well as major sculpting by glaciation and shoreline accretion which has formed much of the lowland areas. These processes have led to a high level of endemism and the area supports the highest level of biodiversity in the region. The area also contains fossil sites that record the evolution of life on New Guinea.

### IUCN MANAGEMENT CATEGORY

II National Park

### BIOGEOGRAPHICAL PROVINCE

Papuan (5.01.13)

### GEOGRAPHICAL LOCATION

The Park is in eastern Papua (formerly Irian Jaya) in the western half of New Guinea, extending 200 km along the central Pegunungan Maoke mountain range and south across some 120-170 km of wet lowland plains to the Arafura Sea between 04°00' to 5°15'S and 137°14' to 138°20'E.

### DATE AND HISTORY OF ESTABLISHMENT

1919: First protected by the Dutch Colonial Government as the Lorentz Nature Monument;

1956: The protected status abolished due to conflicts with local people over unresolved land claims;

1978: The site re-established as a Strict Nature Reserve by the Indonesian Government;

1984: Designated an ASEAN Heritage Park;

1997: Declared a National Park by the Ministry of Forestry, including an eastern extension to include Trikora Peak. This status restored use of its resources to the local people.

## **LAND TENURE**

The Republic of Indonesia. Administered by the Indonesian Park Service for the Directorate General for Nature Conservation (PHPA) of the Ministry of Forestry.

## **AREA**

2,505,600 ha (7.05% of Papua). Extends out to sea to a depth of 10m.

## **ALTITUDE**

From sea level to 5,030m (Puncak Jaya, formerly Mt. Carstenz).

## **PHYSICAL FEATURES**

The Park is one of the world's last great wildernesses, comprising two main biomes, lowland and highland. The wide swampy lowlands of the southern half border with mangrove swamps the Arafura Sea between New Guinea and Australia. The highlands in the north are 210 km of the glaciated snow-capped mountain spine of Pegunungan Maoke or Snow Mountains, the highest mountains in southeast Asia, and their local forms the Sudirman Range in the west and Jayawijaya Range to the east. This gradient within a single protected area from sea coast to snow-capped tropical peaks is exceptional.

The Park covers nine main types of land form: beaches, tidal swamps, meander belts, peat swamps, alluvial valleys, alluvial fans, dissected terraces, mountain slopes and alpine summits. The descending rivers cut deep valleys through the slopes and foothills. Across extensive alluvial plains a large number of rivers carry massive amounts of mountain sediments which build up the shoreline where 5m tides blend land and sea imperceptibly over a wide area. The slight difference in elevation creates a tidal salinity gradient far back into the wide swampy plain, apparent in the changes in types of virgin forest and intersected by countless lakes, winding rivers and streams, which empty into the shallow Arafura Sea. The plains end far inland at the alluvial fans and terraces of the foothills.

The Snow Mountains divide geologically and by vegetation type into east and west sectors near Kwiwawagi village, separating the high peaks of the Sudirman Range from Gunung Daam (4,922m) and Trikora Peak (4,730m) in the Jayawijaya Range. The highest summit is Puncak Jaya which has several peaks: Jayakesuma (Carstenz) Pyramid (5,030m), Ngga Pulu (4,862m) and Meren (4,808m). On the north side the slope is protected as far as the 1,000m elevation. The mountains result from the collision of the Australian and Pacific continental plates, which relatively recently folded and uplifted thick Cretaceous and Eocene metamorphosed sediments. Through the resulting faults igneous rock intruded and rich gold and copper ores were deposited in the Sudirman range, now being worked just west of the Park. Subsequent rising and falling sea levels during the glacial and inter-glacial periods of the Pleistocene and continuous tectonic activity created the present great topographic variety of mountain ridges, valleys, outwash slopes, plateau and escarpment. Moraines now overlie an extremely rugged limestone and sandstone karst topography most expressive in the Grand valley of the Baliem River in the east, where there are pinnacle karst, sinkholes dolines, many caves, and the river itself dives underground. Extensive fossils of ice age plants and animals found in four mountain caves provide evidence of the evolution of life on the island.

The Puncak Jaya area of the Sudirman Range still retains small ice caps - one of only four equatorial highlands (the Andean Sierra Nevada, Mt. Kenya, Kilimanjaro and Ruwenzori in East Africa) high enough to retain permanent ice. However, the Lorentz glaciers are receding rapidly. The main snowfields comprise five separate ice fields on the outer margins of Mount Puncak Jaya that include two small fields which feed the Meren and Carstenz glaciers and a small hanging glacier on the Jayakesuma/Carstenz Pyramid. This area was still covered by 13 sq.km of ice caps in 1936 which melted to just 6.9 km by 1972 and had further shrunk to 3 sq.km by 1999, a trend that will almost certainly continue. The remaining ice is reduced to three patches: the North Wall *firn*, the Meren and Carstenz glaciers. Glaciated valleys, lakes, end moraines and outwash fans remain, and high in the mountains Lake Habbema lies in a swampy alpine basin.

## CLIMATE

Papua lies in the humid tropics with an annual rainfall between 3,160 and 4,100mm in the lowlands, and between 3,500 and 5,000mm in the mountains. West winds prevail between October and March, and from December to March there are usually high waves on the coast. East winds prevail from April to September. Daytime temperatures range from 29-32°C in the lowlands and to below freezing above 4,800m. Early morning snow on the summits of Mt. Trikora and Mt. Jaya occurs regularly down to 3,800m, but permanent snow and ice are found only around the latter. In the mountains, the weather conditions are strongly influenced by the immediate topography.

## FLORA

Fluctuating sea levels and tectonic activity created the conditions for the great floristic biodiversity of New Guinea, particularly in the area around the National Park. The Snow Mountains also form a nearly impassable barrier which has accelerated speciation and produced high levels of endemism. The Park has five main vegetation zones: lowland, montane, subalpine, alpine and nival, and within these at least nine subzones.

The coastal lowland has extensive wetlands of five types: tidal swamps (0-1m), beach (0-4m), meander belt (0-25m) peat swamp (3-50m) and alluvial fans (50-150m). The muddy tidal swamps are a zone of inter-tidal mangroves edged by nipa palms *Nypa fruticans*. It supports among the most diverse and extensive mangrove communities in the world, totalling 301,500 hectares, of five main associations: an *Avicennia/Sonneratia* community, a *Rhizophora apiculata* - dominated community, a *Bruguiera* swamp forest, *Nypa* dominated forests reaching well inland, and mixed riparian mangrove further inland still. The beach vegetation ranges from pioneer herbaceous communities on the first beach ridge to tall mixed and riparian forest upriver. The permanently and seasonally flooded freshwater peat swamps and freshwater swamp forests which total twice the area of the mangrove swamps, have extensive *Pandanus* and sago palm swamp forests, reaching 50 kilometres inland in the west, grading to grass swamp and sedgelands more than 80 km inland along the eastern boundary. Above this level, alluvial valleys rise between 25-100m and alluvial/colluvial foothill fans from 50-150m. These carry dry land evergreen lowland rainforest rich in species, resembling most closely the theoretical climax vegetation type for the area. The multilayered canopy is 30-40m high with 50m emergents. The dominant tree families include Annonaceae, Burseraceae, Dipterocarpaceae, Ebenaceae, Fagaceae, Leguminosae, Meliaceae, Moraceae, Myrtaceae and Sterculiaceae. From 100-650m swampy to mossy to dry heath forests grow on old dissected terraces of podzolised sands, gravels and clays. These forests are distinct from the alluvial forests, being lower, more closed and less rich in tree species; bryophytes abound.

The mountain vegetation changes with elevation in five bands: lower montane rainforest (650-1,500m) on the foothills and lower mountain slopes is the richest forest community in New Guinea with 80 genera and 1,200 species of trees rich in epiphytes, dominated by oaks *Castanopsis*, *Araucaria* and laurel species. The mid-montane zone, which is known as cloud or mossy forest, is dominated by *Nothofagus* species and starts about 1,500m where the slopes start to be often cloud-covered. In the upper montane zone (2,800-3,200m) dominated by various conifers, there is dense growth of epiphytes, ferns, tree ferns and mosses with grass swamp, *Miscanthus* grassland and succession on abandoned gardens. The change to subalpine vegetation occurs fairly suddenly about 3,200m. The lower subalpine forest from 3,200-3,650m has a cold wet climate with a 10m-high closed canopy, with emergents to 15m and is species poor. Its higher limits from 3,650m to 4,170m are dominated by Ericaceae and Epacridaceae, mires, wet sedgeland, and tussock grasses. The alpine zone between 4,170m and 4,585m consists of dwarf shrubs, heath, wet tundra and dry tundra. At 4,200m grasses are dominant and the ground is covered by bryophytes, lichens and scattered scrub. One moraine-field community of *Tetramolopium klossii* heath rooted in a moss carpet has never been seen before in New Guinea and may be restricted to Mt. Jaya. The nival zone consists of bare rocky peaks and algae-stained residual ice caps.

## FAUNA

The fauna contains 64 mammal species, though it is still so little known because of its inaccessibility that there could be as many as 100 species (Nomination document, 1998). There are elements of Gondwanan fauna in its 16 marsupial species: two of the world's three monotremes: the short-beaked echidna *Tachyglossus aculeatus*, and the endemic western long-beaked echidna *Zaglossus bruijnii* (CR); at least four species of lemur-like marsupial opossums including the great-tailed triok *Dactylopsila megalura*, and five species of the similar cuscus *Phalanger* species, two species of tree kangaroo the dingiso *Dendrolagus mbaiso* (EN: discovered only in 1994) and Doria's tree kangaroo

*D. dorianus* (VU), and the New Guinea quoll *Dasyurus albopunctatus*, a cat-like animal. 25 species of rats and mice and 19 species of bat have also been identified recently, many being new records for Papua.

The Park has 650 bird species, 72% of the total number of Papuan birds: 31 species of parrot, 31 species of dove and pigeon, 29 species of sunbird, 13 species of kingfisher, at least 12 species of bird-of-paradise, 6 species of bowerbirds and 4 megapodes. In the Park's highlands three bird species appear to be confined to the alpine zone: orange-cheeked honeyeater *Oreornis chrysogenys*, the endemic Snow Mountain robin *Petroica archboldi* and black-breasted munia *Lonchura teerinki*. Five other alpine level species are endemic, including the Snow Mountain quail *Anurophasis monorthonyx*, long-tailed bird of Paradise *Lonchura teerinki* and Salvadori's teal *Salvadorina waigiuenensis* (VU). Altogether 40 restricted-range montane species occur in the Sudirman range including Archbold's owl-nightjar *Aegotheles archboldi*, short-bearded melidectes *Melidectes nouhuysi*, Lorentz's whistler *Pachycephala lorentzi*, splendid astrapia *Astrapia splendidissima*, Snow Mountain munia *Lonchura montana* and ochre-winged honey-eater *Macgregoria pulchra* (VU). Among the raptors are New Guinea harpy eagle *Harpyopsis novaeguineae* (VU) and white-bellied fish-eagle *Haliaeetus leucogaster*. 26 species are endemic to the central Papuan ranges and three species are endemic to the south Papuan lowlands. Globally threatened birds, of which at least 10 species are found in the lowlands, include the southern cassowary *Casuaris casuaris* (VU), southern crowned pigeon *Goura scheepmakeri* (VU), and Pesquet's parrot *Psittichas fulgidus* (VU). 150,000 insect species are reported.

324 species of reptiles are recorded and 90 species of amphibians were collected during a survey in 1997 but more may yet be discovered. Species of conservation concern include a new undescribed species of skink *Lobulia* sp. Restricted to the subalpine zone, is the rare pig-nosed turtle *Carettochelys insculpta* (VU) which is threatened by hunting and egg collection. Two species of crocodiles also occur, estuarine *Crocodylus porosus* and New Guinea freshwater *C. novaeguineae*. It is estimated that more than 100 species of freshwater fish species live in the Park's waters: catfish, rainbow fishes, gobies and gudgeons are particularly common. Offshore green and hawksbill turtles *Chelonia mydas* (EN) and *Eretmochelys imbricata* (CR) feed in the seagrass beds offshore.

## CONSERVATION VALUE

The Park is the largest protected forest in the Asia-Pacific region and an almost 90% unspoiled wilderness of the greatest importance for preserving an intact transect from coastal lowland swamps to alpine tundra. It therefore protects those species that move along an altitudinal gradient with the year. In 1991, the area was listed in Indonesia's National Biodiversity Action Plan as one of the highest priority sites for conservation particularly for the diversity and representativeness of its flora and fauna. The Park lies in four WWF Global 200 Freshwater Eco-regions, a WWF/IUCN Centre of Plant Diversity and two BirdLife-designated Endemic Bird Areas.

## CULTURAL HERITAGE

Some of the eight distinctive tribal cultures existing in the area have lived in isolation for more than 20,000 years and it is quite possible that there are still communities which have never had contact with the modern world at all. The Asmat believe their ancestors' spirits dwell in trees and so accord them great respect. Rivers, mountains and other natural features are similarly honoured and are controlled by a complex system of cultural taboos and rituals that in the past have helped to prevent over-exploitation of forest resources (Kartawinata & Widjaja, 1988; Petocz, 1989; Manembu, 1991). New Guinea was first discovered to the West in the 17th century - Carstensen was an early explorer. The west half was annexed by the Netherlands in 1848 and became part of Indonesia in 1969 as Irian Barat, then Irian Jaya until 2002 when it became Papua and West Papua.

## LOCAL HUMAN POPULATION

The indigenous local population of eight tribal groups totalling some 6,300 people have to a great extent maintained their traditional life styles. They use the Park's resources from some 50 small scattered settlements and nine villages, hunting, fishing and gathering, with little impact. The highland people include Amungme (Damal), Nduga and Western Dani, also Ngalik and Nkai. They practice rotational agriculture of root crops, mainly taro and sweet potatoes. Pigs play an important role in rituals.

The Amungme (2,500 people) lives in at least 30 communities in the central highlands south and north of Mt. Jaya, at about the 1,000-2,000m level, using the upper mountain between 3,000 and

4,000m for hunting and gathering. They rarely use land over 4,000m as they consider the mountains above this level sacred. Since 1972 the Amungme people have seen rapid changes due to the massive mining operation on their land. They now live, hunt and gather also in lowland forests and on the plains. Some 1,500 Nguga also live within the eastern borders of the Park. A yet undescribed group called the Somohai live in the southern foothills close to the Baliem gorge in the northeast.

The lowland people are two Mimika linguistic groups (of 1,000 people): Kamoro in the south-western corner of the Park, and the Sempan in the centre. In the south-east, are the Asmat (approximately 1,300 people in two linguistic groups). These tribes follow a semi-nomadic lifestyle among the lowland rivers and swamps, supplemented by simple but effective forms of agriculture based on sago *Metroxylon sago* and fishing on the coast. Their traditional economies have evolved in harmony with the environment. However, the Kamoro have been heavily affected by the Grasberg mine a few hundred metres from Mt.Jaya, which destroyed one of their most revered places.

## **VISITORS AND VISITOR FACILITIES**

Owing to difficulties with security and access and lack of facilities, tourists totalled less than 100 in 1998. Before the recent civil unrest, some 50 climbers climbed Puncak Jaya each year. Three trails are used by tourists to the highland basin of Lake Habbema. Hotel facilities are available outside the Park at Timika and Wamena in the northeast. Access is by air from Jayapura to Wamena and Timika, and from Timika, to the north of the Park by the local air service; and to the southern part to the river port of Sawa Erma. There are several airstrips in and around the Park.

## **SCIENTIFIC RESEARCH AND FACILITIES**

A noted early scientific visitor to west New Guinea was A.R. Wallace in 1858. Many scientific and military expeditions have explored the region, including that by H.A. Lorentz in 1910. The most famous expedition was led by the Dutchman Colijin in 1936, one member of which, Dr.J.Dozy, discovered the extremely rich copper and gold deposits in the mountains around Mt.Carstensz; his findings led to the present massive mining operation by Freeport Indonesia just west of the Park. Between World War II and recent times, some scientific work was conducted in the area, notably the Archbold expedition of 1953, and more recently, in preparing for the determination of protected area status. Much remains to be discovered: the great Baliem gorge on the range's northeast side for instance was discovered as late as 1938. Studies with reparations to local people in mind have been carried out for Freeport: in 1994 and 1997 vegetation and wildlife biodiversity surveys were conducted just west of the Lorentz National Park as part of Freeport's reclamation project and environmental impact assessment, and several new mammal species were discovered. The fungal infection (*Phytophthora cinnamomi*) which is causing dieback of the relict Gondwanan Nothofagus forest in mountains of the Park has not yet been investigated (UNESCO, 2010).

## **MANAGEMENT**

In 1990, the Directorate General of Forest Protection and Natural Resource Management approached WWF-Indonesia for help in researching and designing a management plan. In co-operation with the Directorate for Nature Conservation (PHPA), WWF-Indonesia prepared a draft park management system that took into account traditional land tenure and the resource use systems of the tribal communities in the Park, gathering basic social and human ecological information on the surrounding tribal groups. By Law No.5 of 1989 and a 1991 decree from the Ministry of Forestry and Mines and Energy mining inside national parks was already prohibited. Following well-publicised conflicts between the Freeport McMoRan Gold and Copper company and local Papuans over the impacts of the Grasberg mine, the company began to institute a more humane operation. However, in 1996, a group of scientists, including WWF and PHPA staff were abducted in the north eastern part of the reserve and due to political unrest in the area, surveys were restricted to the buffer zone and the lowland Asmat area of the Park. Despite the hostage crisis, WWF and PHPA with the government started a participatory resource mapping program to rationalize land use planning in the buffer zone and to involve local people in boundary delineation, park zonation, and buffer zone development. This was important since its change in 1997 from Strict Nature Reserve to National Park which once again permitted local people to use the forest resources they depended on.

From then on all major stakeholders, the provincial and district governments - NGOs, local communities and private companies, such as Freeport McMoRan Inc. - were involved in management planning and agreed on World Heritage nomination for the site, although at nomination a draft management plan had not yet been confirmed. Since then the Lorentz National Park

Strategic Plan 2007-2012 and Draft Management Plan 2010-2030 have been drawn up but their implementation and the surveillance and comprehensive monitoring of the property have been hindered by the limited funding and staff. In the alpine region mapping of the terrain and in general, definition of the property's boundaries are needed before management can become really effective (UNESCO, 2010). The Park is administered by the Indonesian Park Service for the Directorate for Nature Conservation. The government has been promoting private sector investments in the area and sponsoring projects such as the translocation of villagers, development of a new town, infrastructure, agriculture and industries. To minimise impact on the Park, the provincial government with Freeport Indonesia have developed a spatial plan that directs development away from the Park and creates a large buffer zone along its western boundary.

### **MANAGEMENT CONSTRAINTS**

Law No, 5 of 1989 and a decree from the Ministry of Forestry and Mines and Energy in 1991 prohibit mining inside national parks. Nevertheless many problems stem from the vast scale of the Freeport McMoRan gold and copper mines on the slopes of the Jaya massif near Mount Jaya on the western edge of the Park. Mining concessions now totally surround its western and northern boundaries. The predominantly open-cast mining techniques have had serious environmental impacts: 250,000 tonnes of heavy metal and other wastes are poured into the local river every day, there are also oil spillages, logging for fuel and extensive dormitory development to house the work force of 4,000 (Handelsman, 2009; Kartawinata & Widjaja, 1988; Petocz, 1989). The pollution was at one time denied by the participating Rio Tinto company, and dissenting tribesmen were put down with government help. The development has had a powerful effect on the Amungme tribe, many of whom have been displaced by the operation (Survival International, 1988). However, in 2008 a WHC/IUCN mission found that mine tailings had not so far affected the marine section of the property (UNESCO, 2010). One petroleum exploration title held by Conoco remains in the Park on the southeastern edge. Negotiations are underway to reduce or eliminate its incursions. A forestry concession outside the eastern boundary of Lorentz also directly affects the site by permitting illegal water-accessed logging and poaching, a taking for which compensation is never considered.

Another threat is from road building. The improved road to Timika on the western boundary already aggravates the pressures on local resources. 62 km of a projected 174 km-long high altitude road in the alpine area of the Park from Wamena in the northeast to Yuguru has already been completed, damaging sensitive areas. A proposed east-west road from Timika would cut the Park in half; and a high altitude road across the Park's northwest corner to Wamena and towns on the north side is proposed. A greater and growing threat comes from road and lane building and uncontrolled tourism in the vulnerable high altitude swampy Lake Habbema basin. These and the other roads have degraded the habitat and led to illegal logging, forest fires, landslides, invasion by alien species and spreading of the fungal disease which is causing dieback of the relict *Nothofagus* forest (UNESCO, 2010). Trekking to Mt. Jaya has already had severe ecological impacts due to littering and firewood collecting. Hiking in the moss-fern ecosystem will certainly lead to more degradation. In September 1997, an unusual drought caused by El Niño led to severe forest fires started by farmers' land clearances. These burnt at least 6,000 ha of the Park and led to local famine. Illegal fishing, poaching, trade in protected species, especially birds, and the introduction of exotic species also present problems.

### **STAFF**

In 2000, a Director with 40 regional rangers based in 4 field stations, and a Park headquarters were planned. By 2008 there were 44 members of staff and 60 were projected for 2009 had funds permitted (UNESCO, 2010).

### **BUDGET**

Since 1990 WWF has run a field project costing about US\$300,000 by 1998. The project was extended for 3 years with support from USAID; subsequently WWF-Indonesia and the German government have supported the Park and US\$45,000 was provided by the UNF for technical assistance. In 2007 the management budget was US\$710,000, in 2008, \$1,000,000, but in 2009 was reduced to \$420,000 which is insufficient to run the property (UNESCO, 2010)

### **LOCAL ADDRESSES**

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WWF - Indonesia Program (WWF-IP), P.O. Box 7928 Jl. SKM, Jakarta 12079, Indonesia.

## REFERENCES

The principal source for the above information was the original nomination for World Heritage status. Contains over 40 references and includes a bibliography (Ballard, 1996), of mostly recent studies.

Flannery, T. (1995). *Mammals of New Guinea*. Chatswood, New York.

Government of Indonesia (1998). *Submission for Nomination for Lorentz National Park to be Included in the World Heritage List*. Dept of Forestry / PHPA / WWF-Indonesia. 76 pp.

Handelsman, S. (2009). *Realities and Perceptions of Human Rights in the Mining Industry - A Case Study*. PhD thesis, University of British Columbia, Canada.

Jatam (2005). *Oil Exploitation In Laurenz National Park*. Report with Oilwatch Asia. 30 pp.

Kartawinata, K. & Widjaja, E. (1988). *Consultants' Report on Preparation for Development of Lorentz National Park, Irian Jaya*. UNESCO/Government of Indonesia UNDP/IBRD Proj. INS/8E/013. 73 pp.

Kingsnorth, P. (2003). The Penis gourd revolution: Grasberg Mountain is the holiest site of West Papua's Amungme people. *The Ecologist*. Retrieved September, 2005 from [http://www.theecologist.org/archive\\_detail.asp?content\\_id=225](http://www.theecologist.org/archive_detail.asp?content_id=225)

Manembu, N. (1991). *The Sempan, Nduga, Nakai and Amungme Peoples of the Lorentz area*. WWF Project 4521. WWF - Indonesia, Jayapura. 117pp.

MiningWatch Canada (2003). Save Indonesia's protected forest areas from mining. *Mines Alert*.

Morrison, J. (2001). *Central Range Subalpine Grasslands (AA1002)*. WildWorld Report, WWF.

----- (2001). *Central Range Montane Rainforests (AA0105)*. WildWorld Report, WWF.

----- (2001). *Southern New Guinea Freshwater Swamp Forest (AA1021)*. WildWorld Report, WWF.

----- (2001). *Southern New Guinea Lowland Rainforest (AA1022)*. WildWorld Report, WWF.

Muller, K. (2000). *Risk Assessment of the Kamoro Life-Style*.

Petocz, R. & de Fretes, Y. (1983). *Mammals of the Reserves in Irian Jaya*. WWF/IUCN. Conservation for Development Programme in Indonesia. WWF - Indonesia, Jayapura. pp. 72-75.

Petocz, R., Kirenius, M. & de Fretes, Y. (1989). *Avifauna of the Reserves in Irian Jaya*. WWF/IUCN Conservation for Development Programme in Indonesia, WWF - Indonesia, Jayapura. 226 pp.

Petocz, R. (1989). *Conservation and Development in Irian Jaya: A Strategy for Rational Resource Utilization*. E.J. Brill. Leiden, the Netherlands. 218 pp.

PT Freeport Indonesia (1998). *Biodiversity Surveys in the PT Freeport Contract of Work Area Compilation Report*. 702 pp.

Schodde, R., van Tets, G., Champion, C. & Hope, G. (1974). Observations on birds at glacial altitudes on the Carstensz Massif, Western New Guinea. *Papuan Ornithology* 4; 65.

Silvius, M. (1989). Wetlands in Lorentz proposed National Park, Indonesia. In Scott, D. (ed.), *A Directory of Asian Wetlands*. IUCN, Gland, Switzerland and Cambridge, UK. Pp. 1091-2.

Survival International (1986). Tribal peoples in Indonesia. *Survival International News* 12.5 pp.

[http://survival-international.org/sights.php?gallery\\_id=46](http://survival-international.org/sights.php?gallery_id=46)

UNESCO World Heritage Committee (2010). Report of the 34th Session of the Committee. Paris.

WWF (1997). *The WWF in Indonesia's Irian Jaya Conservation Programme*. Summary of the Lorentz National Park Project 1991-1995 and Final Project Report 1995-1997, WWF - Indonesia, Jayapura.

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