

## World Heritage Sites

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## DJOUDJ NATIONAL BIRD SANCTUARY SENEGAL

*The Djoudj Sanctuary in the Senegal River delta, is a wetland of 16,000 hectares, a large seasonally flooded area of lakes, ponds and bayous surrounded by streams and backwaters. These provide a fragile sanctuary for one and a half million migrant birds and a large breeding population, including white pelican, purple heron, African spoonbill, great egret and cormorant.*

*Threats to the Site: Since 1999 the Sanctuary has been threatened by the rapid invasion of a water plant, *Salvinia molesta*, which had also reached Diawling National Park in Mauritania across the river. This is one of the most invasive plants in the world and has threatened the ecosystem and economy of the region. Use in 2001 of biological control by plant-eating weevils from South Africa, began to clear the weed but may need annual reapplication. The national authorities agreed to inscription on the List to facilitate a three year eradication programme and help their appeal for financial support from donors. By 2004 there had been considerable success but invasion by *Typha australis*, *Eichhornia crassipes* and *Tamarix senegalensis* was becoming more serious.*

### COUNTRY

Senegal

### NAME

Djoudj National Bird Sanctuary  
(*Sanctuaire National des Oiseaux du Djoudj*)

### NATURAL WORLD HERITAGE SITE

1981: Inscribed on the World Heritage List under Natural Criteria vii and x.

1984-88 & 2000-2006: Listed as a World Heritage site in Danger from invasive aquatic vegetation.

### INTERNATIONAL DESIGNATION

1977: Designated a Wetland of International Importance under the Ramsar Convention (16,000 ha).

### IUCN MANAGEMENT CATEGORY

II National Park

### BIOGEOGRAPHICAL PROVINCE

Western Sahel (3.12.07)

### GEOGRAPHICAL LOCATION

Located in the extreme northwest of the country on the Mauritanian border, in the delta of the Senegal River about 60 km north-northeast of Saint-Louis in a wide low valley 10 km north of Ross-Bethio: 16° 30'N, 16°10'W.

### DATES AND HISTORY OF ESTABLISHMENT

1962: A nearby area of 3 ha first classified a Nature Reserve by Decree 62-065;

1971: Designated a National Bird Sanctuary by Decree 71-411 (13,000 ha);

- 1975: Enlarged by Decree 75-1222 to 16,000 ha;
- 1977: Designated a Ramsar Wetland site because of its importance to birds;
- 1985 & 1989: Construction of the Diama dam downstream and the Manantali dam upstream;
- 1984-7: Listed as a World Heritage site in Danger because of the alteration of water levels by dams and invasion by the waterweed *Salvinia*; also listed on Montreux record of wetlands in danger;
- 1993: Re-listed on Montreux record because of *Salvinia molesta* infestation and salinisation;
- 2000-06: Re-listed on the list of World Heritage in danger because of re-infestation by waterweed.

## LAND TENURE

Government, in Region du Fleuve province. Managed by the National Parks Service of the Ministry for the Protection of Nature.

## AREA

16,000 ha; adjoining Diawling National Park, Mauritania (13,000 ha created 1991, a Ramsar site in 1994).

## ALTITUDE

From near sea level to about 20m.

## PHYSICAL FEATURES

The Sanctuary is a small part of the wide delta floodplain of the Senegal river, the second largest river in west Africa, which marks the line between the Sahara and the Sahel and forms an important ecological barrier on the desert edge. A third of the wetland is in Mauritania (Diawling National Park). The Sanctuary is in the basin of the brackish Djoudj bayou (distributary or *marigot*) between the main river channel to the north and the Gorom bayou to the south. It is an area of three related habitats: bayous, meres and backwaters which are dry for three months every year, usually flooded basins (*cuvettes*) and irregularly flooded alluvial plains. During the dry season it is the only naturally green spot along the whole river. The ground is covered with impermeable salt-impregnated alluvial clays forming saline flats. It was originally steppe, paddy-fields, marshes and lagoons subject to annual flooding from September on. But dykes have canalised the river, on the left side and an anti-saltwater barrier built downstream, the Diama dam, now keeps fresh water in the basin for long periods, replacing the former balance of wet and dry, fresh and saltwater cycles. Without regular flushing, the soil has become salinised and polluted by agricultural fertilisers and pesticides.

## CLIMATE

This is a semi-arid Sahelian climate with alternate wet and dry seasons, tempered by the ocean and sea winds. The rainfall is variable but the mean annual amount, falling mainly between July and mid-September, never exceeds 300mm. The evaporation rate is ten times the annual rainfall, but during the dry months of March to June, it is the most humid area in the region. There is 40% dry season and 70% wet season humidity. Flood levels are highest in October, but in recent years rainfall has been less than a fifth of the average and Djoudj has become much drier. The mean annual temperature is 27°C, but during the cold season between December and March the temperature can fall to 10°C.

## VEGETATION

The vegetation is a mosaic of Sahelian habitats, the product of low rainfall on halomorphic soils. The savanna is dominated by spiny bushes, acacias such as *Acacia nilotica* (which needs seasonal flooding) *A. tortilis*, *A. seyal*, *Balanites aegyptiaca*, *Tamarix senegalensis* and *Euphorbia balsamifera*. Herbs include *Mimosa pigra*, *Echinochloa colonum* and *Aeschynomene* spp.; grasses include *Oryza longistemma*, *Echinochloa stagnina* and *Vossia cuspidata*. Halophytic plants, particularly *Salicornia* spp., cover much of the area. During the rains and because a barrier dam has prevented salt water from moving upstream, dense reedmace *Typha domingensis*, common reed *Phragmites australis*, *Sporobolus robustus* and waterlily *Nymphaea* spp. now grow in the flood zones. In the shelter of this, the aquatic vegetation became dominated first by floating water lettuce *Pistia stratiotes* and seashore paspalum *Paspalum vaginatum* then, since 1999, by giant salvinia *Salvinia molesta*, a rank fast-reproducing freshwater invader, to levels which have become dangerous to other life (Triplet *et al.*, 2000).

## FAUNA

The Sanctuary is classified by BirdLife International as an Important Bird Area for breeding, staging and wintering waterbirds. For millions of Palaearctic ducks and other aquatic birds, including aquatic warblers, this wetland, like the Niger swamps in Mali and Lake Chad, is one of the great staging and wintering areas for birds that have just crossed the Sahara. From September to April, some three million migrants pass through, joining a dense population of resident breeding birds. Between 450-550,000 Anatidae, 250,000 Limicolae, 20,000 greater flamingos *Phoenicopterus ruber*, 3,000-12,000 lesser flamingos *Phoeniconaias minor* and 2,500 European spoonbills *Platalea leucorodia*, owe their winter survival to the quality of the environment of the Senegal river delta (Triplet *et al.*, 2000). About 10,000 white pelican *Pelecanus onocrotalus* nest here regularly, as well as pink-backed pelican *Pelecanus rufescens*.

The nearly 400 species include great cormorant *Phalacrocorax carbo*, white-breasted cormorant *P. lucidus* and African darter *Anhinga rufa*, night heron *Nycticorax nycticorax*, squacco heron *Ardeola ralloides*, green heron *Butorides striata*, great egret *Egretta albus*, little egret *E. garzetta*, purple heron *Ardea purpurea*, grey heron *Ardea cinerea*, yellow-billed stork *Mycteria ibis*, African sacred ibis *Threskiornis aethiopicus*, glossy ibis *Plegadis falcinellus*, marbled teal *Marmaronetta angustirostris* (VU), garganey *Anas querquedula*, shoveler *A. clypeata*, pintail *A. acuta*, ferruginous duck *Aythya nyroca*, white-faced whistling duck *Dendrocygna viduata*, fulvous whistling duck *D. bicolor*, spur-winged goose *Plectropterus gambensis*, black-crowned crane *Balearica pavonina* (VU) and African spoonbill *Platalea alba*. Pallid harrier *Circus macrourus* and lesser kestrel *Falco naumanni* (VU), Arabian bustard *Ardiotis arabs*, Senegal bustard *Eupodotis senegalensis*, Denham's bustard *Neotis denhami*, Senegal thick-knee *Burhinus senegalensis*, ruff *Philomachus pugnax*, and black-tailed godwit *Limosa limosa* are also seen.

Other animals include warthog *Phacochoerus aethiopicus*, jackal *Canis aureus*, red-fronted gazelle *Eudorcas rufifrons* (VU), dorcas gazelle *Gazella dorcas* (VU) and West African manatee *Trichechus senegalensis* (VU). The Nile crocodile *Crocodylus niloticus* have been successfully reintroduced and is reported to be on the increase. There are also python *Python sebae* and Nile monitor lizards *Varanus niloticus*.

## CULTURAL HERITAGE

Human settlement in the area, mainly dependent on coastal and estuarine fishing, has been traced back 500 years.

## LOCAL HUMAN POPULATION

There are seven villages in the surrounding country with some 7,000 inhabitants in 2004 more or less involved in site conservation. The local Ouolof and Halpulaar, Haratin and Sarakolé farmers have developed ways of using the local resources subtly adjusted to the very varying regime of flooding and drought: fishing, mixed farming, rice-growing and grazing cattle on the dry season pastures. There are also transhumant herders, Maures from Mauritania and Peulh from inland, who move in as the wet season ends, with whom there is conflict if drought forces them to stay too long in the floodplain (van den Top, 1990).

## VISITORS AND VISITOR FACILITIES

14,000 tourists visit the Sanctuary each year. The main camp is the Djoudj Hostellerie with 80 rooms. A new 14-bed camp is the result of a village initiative. These are closed during the rainy season but there are hotels in St Louis nearby. There are three bird watch towers on the borders of the most important waterbodies and five observation points. Canoes can be hired. A small eco-museum has been constructed by the St Louis Club *Jeunes-Nature*.

## SCIENTIFIC RESEARCH AND FACILITIES

Research includes rodent studies, bird ringing to investigate migration routes, and population dynamics. *L'Office de la Recherche Scientifique et Technique d'Outremer* (ORSTOM) has sponsored research in this area since 1955. Studies of waders were carried out in 1983-1984 by the Tour du Valat Biological Station in France. Studies of waterbirds have also been carried out since 1989 by the *Office Nationale de la Chasse et de la Faune Sauvage et Oiseaux Migrateurs du Paléarctique*. An expedition to catch and ring palaearctic migrants was undertaken in 1990, for which some 3,300 birds of over 70 species were ringed (Beecroft, 1991). There is an observation hut on site. A biological research station was

established in St. Louis in 1990 for the area's parks and with new equipment had by 2008 begun an aquatic warbler tagging program and monthly bird-count patrols with the help of volunteers (IUCN,2008).

### **CONSERVATION VALUE**

The Sanctuary was mainly established as an important area for the protection, study and viewing of birds. It supports one to two million waterfowl and with Diawling National Park, is one of the first fresh water sources they reach after crossing 2000 km of the Sahara. It is one of the main West African sanctuaries for Palaearctic migrants.

### **CONSERVATION MANAGEMENT**

In 1991 IUCN and WWF financed a plan for the Sanctuary to cover the management of water, habitats for important species, relations with local people, tourism, and education in conserving the area. Water supply in the region is a problem, and permanent dams were built to regulate the flow of the Senegal River, including a dam in Mali at Manintali. With the completion of the Diama anti-salinity barrage downriver, the hydrology was altered. The water supply for Djoudj became more secure than in the past except in a small undyked area and it became possible to flood the Park each year, in fact there was difficulty in drying it out. A dyke was built around the park and a system of dams was maintained to counter the effects of the barrage, and of the large hydroelectricity and irrigation dam upstream in Mali. The aim was to ensure that water levels would not change with alterations in the river flow from intensive upstream cultivation which could also increase levels of herbicide and pesticide residues in the water.

Effective management depended on the continued reinforcement of the dykes, repair of water-control structures, dredging of silted canals and regular monitoring of the hydrological regime (Triplet *et al.*, 2000). Until 1987 enforced exclusion of the local people and rigid protection aroused much hostility. Since then there has been a policy of cooperating with local villagers whose numbers are growing, allowing them to use the varied resources of the site in the way they know best (van den Top, 1990). The Sanctuary is closed for three months of the year because of the impossibility of moving about during the rainy season. Wardens are stationed in five watch posts, one in the centre and four on the boundaries. Administration zones were co-ordinated by a ranger. From 1994 to 2002 the Park applied two management plans. By 2006 with the clearing of channel-blocking rushes and the use of a water supply management calendar to anticipate floods, and the conditions for migrant breeding fish and birds improved, a three-year Action Plan was developed. This focussed on 1) preservation and restoration of the ecological characteristics of the property, 2) development of ecotourism facilities and products and 3) integration of the property within the socio-economic and environmental landscape. The GEF has also supported the development of income-generating activities: a butane gas network to combat fuel wood cutting; a micro-credit system to support local crafts and fodder crop growing to combat cattle foraging in the property. It has also supported environmental education in the schools neighbouring the property (UNESCO,2005;2009).

### **MANAGEMENT CONSTRAINTS**

During the 1970s rainfall was too low for water levels to be normal. In the early 1980s the *Compagnie Sucrière Sénégalaise* built a temporary dam just upstream at Kheune to prevent salt water flowing up the Senegal River in the dry season. This reduced the supply of fresh water to Djoudj but the 1984 flood swept it away and Djoudj was replenished normally. In the 1984/1985 dry season, Djoudj was connected by canal with fresh water above the Kheune barrage to stop it drying out. However, because of corrosion of one of the two sluice gates into the Sanctuary, staff were unable to control water levels which were largely determined by the Diama reservoir levels downstream (Dugan, pers.comm.,1987). Pelican nesting sites were threatened, so substitute islets were successfully built for the birds' use. Djoudj was placed on the World Heritage in Danger list between 1984 and 1988 because of the alteration in water levels by these dams. Very costly measures were taken to eradicate the invading weeds, first mechanical, and then, successfully, by the concentrated use of biological control by the weevil *Cyrtobagus salviniae* (Triplet *et al.*,2000; Pieterse, 2002).

The construction of the Diama barrage for irrigation and drinking water stopped salt water from entering the property but it dried out the downstream floodplain, estuary and mangroves, salinised the soils through lack of flushing, reduced water levels and the availability of food to birds, shrinking their numbers, and created ideal conditions upstream for invasive freshwater weeds. These were mainly reed mace *Typha australis*, which forms very dense barriers, water lettuce *Pistia stratiodes*, now reduced, water hyacinth *Eichhornia crassipes*, and the major current danger, a south Brazilian water weed *Salvinia molesta* which originated from imported chickenfeed. This can double in area every four days, and becomes a floating mat which chokes all other life, making fishing and river transport almost

impossible. It forms a substrate for other invasive weeds, exhausts the river's oxygen and increases the habitat for disease-bearing snails and mosquitoes. It became such a threat to the riverine ecology and the local economy that the site was again listed in danger between 2000 and 2006 when invasion by *Typha australis* and *Eichhornia crassipes* returned, with silting and salinity, because of the breakdown in the water regulation system (IUCN, 2003).

The WHB, IUCN, Ramsar Secretariat and FAO with GEF support collaborated with the State in a program of eradication which could become a model for Africa (UNESCO, 2002). By 2006 many waterways and lakes and several marshes had been cleared, increasing the area of open vegetation-free waters in ponds and backwaters, improving water circulation and water quality and increasing fish, which led to the return of many species of waterbirds. The system had recovered enough for the site to be declared out of danger in 2006 although the riparian weed tree *Tamarix senegalensis* had then also become a problem. The clearance was funded through the Integrated Coastal and Marine Resource Management program, and GIVAQUE, an invasive aquatic vegetation management project for the inhabitants of five villages funded by the African Development Bank. Although habitats at Djoudj are now adapted to the main threat, recurrent secondary threats to the Sanctuary remain: overgrazing, hunting and tree-cutting, poor management capacity and lax visitor control (IUCN,2008).

### STAFF

There is one Warden with total of 8 rangers (M.Nyaligu,pers.comm.2005), augmented by 3 more by 2008 (IUCN,2008). Since 2007 boats, a vehicle and monitoring equipment have also been added (UNESCO,2009).

### BUDGET

In 1995 the government provided funding of 3 million francs. In 2000 the WHB conditionally approved US\$ 130,475 to finance Phase I of the *Salvinia* eradication campaign; and in 2001, US\$21,690 for a regional workshop in methods of inventorying wetlands (UNESCO, 2001). The Government of the Netherlands and the GEF supported the construction of watch towers and pelican nesting platforms. In 2005 11 million francs CFA\* (US\$20,620) was provided by the government (National Park Office, 2005). By 2008 a total of US\$278,567 had been provided from international sources for emergency assistance, technical assistance and training (IUCN,2008). \* franc du Communauté Financiere Africaine.

### LOCAL ADDRESS

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