3.13 SENEGAL

Introduction

Senegal has an area of 196 720 km^2, a population of 6 177 000 (1983) and therefore, a mean population density of 31.4 persons/km^2. It is bounded by Mauritania in the north, Mali in the east, Guinea and Guinea Bissau in the south and the Atlantic Ocean in the west. It encompasses Gambia except for the coastal section. About 90% of the land surface is less than 100 m asl, and the highest land is found in the extreme southeast where several hills exceed 400 m and a small area attains 500 m asl.

Drainage is entirely to the sea, principally via the Casamance, Gambia, Saloum and Senegal Rivers. The first and third of these streams rise in Senegal and are lowland rivers throughout, but the Gambia and Senegal Rivers both rise in the Fouta Djallon Mountains in Guinea. The Senegal River is the largest and forms the eastern and northern borders of the country over a distance of more than 1350 km, except for a 150 km section where the river is entirely situated within Senegal.

Climate

Three principal winds influence the climate. The hot dry Harmattan, which from the east or northeast off the Sahara, prevails over the country during the dry season. At this time the Alize blows down the coast from the north or northwest, and the warm air of the Harmattan rises over the cool air of the Alize along the coast, causing coastal cloud but little precipitation. Rain comes principally with the southwesterly trade winds which blow up from the South Atlantic, and which prevail over the country as the inter-tropical convergence moves north from June until October. Thus the wet season is longest at the coast in the southwest, and shortest in the north and northeast. At the coast Ziguinchor (12°35'N/16°20'W) has a 5 month wet season, Dakar (14°38'N/17°27'W) a 3 month wet season, and Saint Louis (16°01'N/16°30'W) only a 2 month wet season. Precisely the same pattern is followed inland. Mean annual precipitation decreases from south to north in a series of parallel bands across the country.

At Ziguinchor the mean annual rainfall is 1547 mm. No less than 99% of this (1527 mm) falls between June and October, with 1256 mm (81%) during July-September. Mean monthly precipitation is greatest in August (532 mm), while December, January, February and March are virtually rainless. The mean four monthly total for these months is less than 2 mm. There are close to 90 rainy days each year at Ziguinchor. Farther inland at a similar latitude, the rainy season is equally long, but less rain falls, e.g. close to 1300 mm at Kolda (12°56'N/14°55'W) and 1200 mm at Kedougou (12°35'N/12°09'W). The number of rainy days is also marginally fewer. At Dakar mean annual precipitation is only 578 mm, and 95% of this falls in the three months July to September. There are 42 rainy days/yr on average. At Saint Louis, mean annual precipitation is 381 mm. Virtually all of this falls in August

and September and there are but 33 rainy days each year. Podor (16°35'N/15°02'W) in the far north receives 330 mm rain/yr and is the most arid station in Senegal.

Temperatures are generally lower, and daily variations smaller, at the coast than inland. For example, at Dakar the mean monthly maxima range from 24-29°C throughout the year, while the minima range from 16-23°C. By contrast, at Matam (15°40'N/ 13°18'W) on the eastern border the corresponding figures are 30-41.5°C and 12-25°C.

Wetlands

The principal wetlands are the great floodplain of the Senegal River, and the estuarine and deltaic systems at several river mouths. There are numerous small seasonal and permanent swamps on the upper courses of the affluents of the major streams, and in the northwest, wetlands occur in the swales of extensive parallel dune systems.

List of Wetlands Described

1. The Senegal River Floodplain
2. The Senegal River Delta Complex
3. The Saloum River & Delta
4. The Gambia River Floodplains
5. The Casamance Estuary
6. Minor Coastal Wetlands

1. The Senegal River Floodplain
Country: Senegal
Coordinates: 14°52'-16°39'N/12°23'-15°41'W
Area: 656 000 ha (c. 400 000 ha in Senegal)
Altitude: 7-30 m asl
Nearest Towns: Bakel (on N floodplain); Richard Toll (on S floodplain)
General: The Senegal River rises in the Fouta Djallon Mountains close to a point 12°03'N/ 11°18'W, but the principal tributary, the Bafing River, rises much farther south on the Guinean Dorsale (10°42'N/11°55'W). Because of the great seasonality of the precipitation over the entire catchment area, the river is very prone to flooding, and this is exacerbated by the fact that most of its course is very flat. Indeed along the entire Senegal border the river descends less than 200 m, and over its last 1000 km it falls only 100 m, thus having the very shallow mean gradient of 1:1000. In places it meanders exceedingly, and it spreads its floodwaters over a broad plain for much of its length. At first the floodplain is discontinuous, but from Bakel (14°54'N/12°26'W) downstream it is unbroken. From this place the river describes a great arc, northwestwards, westwards and finally southwestwards, to reach its delta at Saint Louis. The middle floodplain is approximately 410 km long between Bakel and Richard-Toll (16°25'N/15°42'W) and has a mean width of 16 km, and provides a seasonally inundated area of 656 000 ha above the delta. Over much of the floodplain the river flows in more than one channel and there are many anastomoses and numerous lakes in abandoned sections of channel. The delta complex which measures 80 km

from base to apex, and almost 80 km along its base at the coast, provides a further 320 000 ha of seasonally inundated land. Of the total of 976 000 ha, approximately 40% is in Mauritania.

Hydrology: Rainfall over the headwater catchments of the Senegal River is 1500-2000 mm/yr, but over the middle floodplain it ranges from 330-600 mm, while Class A Pan evaporation varies from 1600-2000 mm/yr. The flood from Guinea spreads over the plain between July and November when it peaks, and then begins to decline until February, by which time most of the plain is dry. During the flood, the mean peak volumetric flow in the river at Bakel, estimated over 64 years, is 4500 m^3/sec. It is estimated that in exceptionally wet years, such as may occur once a century, peak flow may rise to 10 000 m^3/sec, while in the drought year of 1913 it fell to just 1040 m3/sec. The mean annual volumetric discharge, also averaged over 64 years up to 1980, is 780 m^3/sec, with an all time annual high of 1247 m^3/sec in 1924, and an all time annual low of 272 m^3/sec in 1913. During the dry season the flow is dramatically reduced, to a mere 10 m^3/sec at Bakel, and the river is then greatly contracted in its bed. At this time of year salt water penetrates far inland, regularly passing RichardToll, about 140 km upstream. Salt water intrusion to the floodplain is most noticeable during droughts.

Flora & Fauna: The river has pronounced levees and carries a belt of gallery forest. All the usual Soudanian species occur in this, together with some Sahelian species in the north. However, *Acacia nilotica* is predominant over very large areas, while *Cola laurifolia, Cynonzetra vogelii* and *Diospyros elliotii* are prominent in sites which are permanently moist. The lower parts of the floodplain have heavy clay soils and are covered by typical floodplain grasses, as described in the regional introduction, while the fringes and levees, which experience comparatively shallow and brief inundation, are sandy. These carry both herbaceous and arborescent vegetation. The vegetation of the numerous lakes and lagoons varies depending upon how permanent they are and how much the depth of the water fluctuates over a year. Permanent herb swamps around the larger water bodies are dominated by *Phragmites* and *Typha.*

Human Impact & Utilisation: About 550 000 people live on the floodplain, many in small towns like Richard Toll, Podor, Dagana and Boghe. The traditional industries practised on the floodplain are cattle herding, fishing and agriculture.

Fishing used to produce an annual catch of about 33 000 tonnes, but a series of dry years since the early 1970's has drastically reduced catches. Most fish are caught when they leave the floodplain and congregate in the channels as the flood subsides. Some 10 000 people are currently engaged in the fishing industry.

In the past the area used to support about 1 500 000 cattle and 1 000 000 sheep and goats, but the recent dry years have greatly reduced this number. It has been estimated that 27% of the cattle died in 1984 (Drijver & Marchand, 1985).

The majority of the floodplain residents are engaged in the traditional system of agriculture known as walo. Cultivation begins immediately after the floods subside. Millet, beans and water melons are the most important crops on the deeply inundated parts of the plain, but the shallow sandy fringes are used to produce maize, tomatoes and

potatoes as well, and these latter areas produce by far the heavier yields. Some 40 000 - 180 000 ha is cultivated this way each year. A further 30 000 ha is now under irrigation, 25% of which is devoted to sugar production. Small irrigation schemes are encouraged, whereby a group of villagers can cultivate 14-20 ha. Numerous dykes and channels have been built on the floodplain to facilitate irrigation culture.

Hunting is no longer very important on the floodplain, most of the big game having already been hunted to extinction. Only *Phacochoerus aethiopicus* survives in substantial numbers and this is still hunted.

In 1972 the Organisation pour la Mise en Valeur du Fleuve Senegal (OMVS) was created by Mali, Mauritania and Senegal to develop water management policies and projects. Among the proposals of OMVS were that the Bafing River should be dammed at Manatali in Mali, 1200 km upstream, and that the Senegal River should be dammed at Diama, 27 km upstream from Saint Louis. This lower dam (closed late 1986) is designed to prevent salt water intrusion, and it is intended that control of water levels by the two dams will permit year round navigation between Saint Louis in Senegal and Kayes in Mali. It has been proposed that a dyke should be cut alongside the right bank of the river through the delta, to prevent river water flooding a large part of the delta. However, the wisdom of this is now questioned by a number of authorities and the dyke may indeed not be built. It is proposed that a deep water port should be built at Saint Louis and that a canal should provide a navigable passage through the delta to the river in order to permit floodplain produce to be shipped overseas. The dams will provide hydroelectric power and provide for irrigation on the periphery of the floodplain.

There can be little doubt that the full implementation of these schemes will result in the loss of most of the floodplain and of a great deal of riverine and levee forest, and that they will precipitate socio-economic upheaval for the half million people who live on and depend upon the floodplain. Nevertheless, the controlled availability of water at certain points will provide the potential to rehabilitate wetland areas which have lost their water supply as a result of previous developments. Drijver & Marchand (1985) comment upon the potential problems in some detail.

Conservation Status: Unprotected.

2. The Senegal River Delta Complex
Country: Senegal
Coordinates:15°44 ' -16°29 'N/15°35' -16°29 'W
Area: 320 000 ha (c. 200 000 ha in Senegal)
Altitude: 0-4m asl
Nearest Towns: Saint Louis (on delta); Dakar (200 km SW)
General: The delta comprises large areas of low lying seasonally flooded land, some small areas of dry land, areas of semi-permanently wet sand, river channels, islands, and numerous lakes, some of which are 5 km long and 2-3 km wide. The main channel of the Senegal River constitutes the border with Mauritania through the delta. The Langue de

Barbarie, where the river reaches the sea south of Saint Louis, is an area of sand-bars, tidal lagoons and saline mudflats fringed with mangroves.

A parallel series of SW-NE trending sand dunes occurs in northwest Senegal and the Senegal River crosses the north end of this system before swinging southwestwards to reach the sea by flowing along the Atlantic side of the outer line of dunes. The dune system is 125 km wide from east to west, and some 45 km long from north to south, with a total area of more than 575 000 ha. Drainage from the Vallee du Ferlo crosses several of the eastern dune ridges perpendicularly, but is then diverted northeastwards between dune ridges where it expands to form a series of little lakes, culminating in Lake Guiers, after which it enters the head of the Senegal River Delta at Richard Toll. Lake Guiers is the only large freshwater lake in the country and measures 35 km in length with a maximum width of 7.5 km. At high water the open water surface is close to 17 000 ha. Apart from the Lake Guiers system, many of the dune swales are permanently moist or marshy.

Hydrology: The seasonal flood at the delta rises in August and persists through November. Maximum flood depths are 1.5 m over the lowest lying areas. There is little influx to Lake Guiers from the Vallee du Ferlo in most years and the principal water supply is from the Senegal River at Richard Toll. Here, water is diverted into the lake through valves in the dyke.

Flora & Fauna: Floodplain grasses occur on the delta, and permanent reed swamps fringe the lakes and the river channels. Some stunted trees occur on the high land and levees, but the area is saline due to the regular intrusion of sea water and has a harsh Sahelian climate with a severe dry season. For much of the year only the vegetation fringing watercourses and waterbodies is noticeably green. At the river mouth stable sand-bars are colonised by littoral species such as *Alternanthera maritinza, Ipomoea pescaprae, Sesuviunz portulacastruin* and *Sporobolus* spp. Lake Guiers is fringed by reeds and sedges and has a typical submerged and floating flora.

Lake Guiers is an important site for the rich and prolific avifauna of the district, especially when the other delta wetlands dry up. It harbours a small population of manatees, and almost the full spectrum of small aquatic mammals is present, as detailed in the regional introduction. The other lakes of the delta are similar to Lake Guiers in terms of their fauna, although only the Djoudj National Park is known to contain resident manatees. Sand-bars at the river mouth are nesting sites for the marine turtles *Chelonia mydas,* and *Dermochelys coriacea. Felis caracal, Herpestes ichneumon* and *Varanus niloticus,* all of which may prey upon young birds and their eggs, are known from the delta. The two latter species are present in large numbers. *Python sebae* is also common. The area has a rich avifauna, typical of the West African coast, but among notable species are *Pandion haliaetus,* which overwinters, together with *Alopochen aegyptica, Anas acuta, A. angustirostris, A. clypeata, A. querquedula, Nettapus auritus, Plectropterus gambensis* and *Sarkidiornis melanota.* Species which nest here include *Anhinga rufa, Ardeola ralloides, Bubulcus ibis, Casmerodius albus, Egretta garzetta, E. intermedia, Ibis ibis, Nycticorax nycticorax, Platalea alba,* and *Threskiornis aethiopicus.* Dupuy (197 1 a,b,c, 1972) and Roux (1973a,b) give some account of the mammal and bird faunas of the delta.

Human Impact & Utilisation: Proposals to alter the flooding regime of the delta are recorded in section 3.13.1. Many dyke systems have been constructed in the delta to influence flooding patterns, and these have been detrimental to wildlife in the complex. The various programmes to control the hydrological regime will all result in a reduction of flooding and a loss of wetland habitat. Lake Guiers serves as a reservoir for several towns including Dakar. The flooding of Lake Guiers is contrived artificially and its water is used for the sugar refinery at Richard Toll as well as for domestic consumption.
Conservation Status: Important wetland sites are protected in the Djoudj and Langue de Barbarie National Parks. The Djoudj Park is situated in the northern part of the delta (16°30'N/16°10'W) and was created in 1971. It lies between the main river channel and the Djoudj and Goram Bayous and comprises 16 000 ha of low-lying saline flats. It retains floodwater longer than most other parts of the delta. It is in close proximity to the Ndiael Bird Reserve of 46 500 ha, and will be contiguous with a proposed National Park in Mauritania. The Langue de Barbaric Park at the Senegal River mouth was established in 1976 and enlarged in 1977 to an area of 2000 ha. It is estimated that more than 3 million migrant birds pass through the parks each year including large numbers of *Anas acuta, A. clypeata, A. querquedula, Lirnosa limosa* and *Philomachus pugnax.* The Djoudj Park is a nesting site for large numbers of *Pelecanus onocrotalus* and several species of ducks, geese, cormorants and herons.

3. The Saloum River & Delta
Country: Senegal
Coordinates: 13°34'-14°10'N/15°48'-16°48'W
Area: 150 000 ha
Altitude: 0-5 m asl
Nearest Towns: Kaolack (at head of delta); Dakar (125 km NW)
General: The Saloum is a small river, formed by the confluence of numerous intermittent headwater streams, the longest of which rises 105 km east of Kaolack (14°09'N/ 16°08'W). The river reaches the sea in a drowned but shallow valley and it is the marine transgression which, on a map, gives the Saloum the appearance of a major river. At the coast the river has a substantial delta which shelters behind the southward pointing spit of Sangomar. The main river channel reaches the sea at the end of this spit, Point Sangomar, and the major part of the delta lies below this on the south bank of the river.

The delta stretches along the coast for a linear distance of 72.5 km and reaches 35 km inland, while mangrove swamps extend almost 70 km upstream to Kaolack. South of the main river channel the delta comprises a network of anastomosing streams weaving between mangrove covered mud islands, with only small areas above high tide level. In this section several other seasonal streams enter the complex from the landward side. To the north of the main channel the delta is more sandy. Some islets on this side support mangroves, but others are subject to infrequent tidal flooding and support herb fields, or are more or less devoid of vegetation, while areas on the fringes experience seasonal rather than tidal inundation and support typical floodplain grasses. There are also large areas of permanently wet but sparsely vegetated saline sand. In total the delta wetlands cover 150 000 ha, some 70% of which is mangrove forest.

Mangroves extend upstream for 25 km between the delta and Kaolack in a belt 5 km wide, but thereafter the river meanders on a wet sandy plain, through Kaolack, for a further 32 km. It finally peters out in a patch of little lakes into which the intermittent headwater tributaries flow. In dry cycles, saline influence extends this far inland.

Hydrology: Subject to seasonal high water flooding, but principally under marine influence.
Flora & Fauna: As described in the regional introduction. Principally a mangrove system. Manatees and marine turtles are present in the delta and mona and colobus monkeys are present in the forest trees. The avifauna is typical of the West African coast, but among the more interesting species breeding here are *Egretta gularis, Hydroprogne tchegrava, Larus cirrocephalus, L. geneii, Sterna hirundo arid S. maxima. Pandion haliaetus* overwinters here, as does *Nurnenius phaeopus. Phoenicopterus Tuber* sometimes breeds in the salt flats upstream, above Kaolack.
Human Impact & Utilisation: The mangrove forest has traditionally been exploited, and this continues outside the park, while the creeks are fished, and shellfish and crabs are also taken from them. There are plans for industrial and agricultural (rice) expansion in the area and these pose potential threats.
Conservation Status: The Sine-Saloum National Park occupies a large part of the delta, covering 72 000 ha, and is itself situated within the larger Biosphere Reserve of 180 000 ha. The Biosphere reserve includes 23 000 ha of seasonally flooded lands, 72 000 ha of land under marine influence, i.e. tidal swamps, sand-bars, lagoons etc., and 85 000 ha of dry land. It is planned that the park shall become part of an international park with a new section to be added in the south, across the Gambian border to include the mangroves at the mouth of Karenti Bolon.

4. The Gambia River Floodplains
Country: Senegal
General: The estuary of the Gambia River is almost entirely situated in Gambia, but affluent channels on the north bank carry mangrove and other halophytic vegetation across the border into Senegal. The most seaward of these watercourses is the Mini Minium Bolon which branches over the border. The longer branch, the Koular Bolon, is tidal for a linear distance of 12 km and supports mangroves (13°38'N/16°06'W) 8 km across the border. There are 4000 ha of wetland in Senegal on this system. Farther east (15°45'W) the Bao Bolon is flanked by a belt of saline sand flats for 33 km across the border. The flats are 5 km wide at the downstream end and are subject to a combination of tidal and seasonal inundation over an area of 9000 ha.
East of Gambia, seasonal floodplains extend along the Gambia River in Senegal for a distance of 70 km, finally reaching an altitude of 20 in asl. Another floodplain extends for 105 km up a tributary, the Koulountou River, crossing Senegal and reaching the Guinean border at an altitude of 25 m asl. The floodplains vary from 1.5-5 km wide, and there are about 53 000 ha of wetland in the system.
Hydrology: The Mini Minium and Bao Bolons are tidal. The flood on the upper Gambia River and the Koulountou River rises between July-November and subsides before the end of January, covering some land to a depth of 5 m.

Flora & Fauna: Typical floodplain grasses and Soudanian gallery forest types accompany the rivers, as described in the regional introduction. *Cola laurifolia, Cynometra vogelii* and *Diospyros elliotii* occur in swampy riverine sites, with *Acacia nilotica, Baissea multiflora, Borassus aethiopum, Crateva religiosa, Dalbergia saxatilis, Diospyros mespilifornzis, Erythrophleunz guineense, Landolphia dulcis, Raphia sudanica, Syzygium guineense* and *Ziziphus nzucronata* on levees and islands. Sedges fringe the rivers, notably *Cyperus baikiei,* together with aquatics such as *Rotula aquatica* (Ehretiaceae) and *Hygrophila odara.* Permanent swamps occur in sections of abandoned river bed. Here *Phragmites* and *Typha* are present, together with some swamp forest trees.
The fauna is typical of a partly forested Soudanian river floodplain, but big game have been hunted to extinction in all but the protected areas. *Crocodylus cataphractus, C. niloticus, Hippopotamus amphibius, Loxodonta africana, Osteolaemus tetraspis, Panthera pardus* and *Syncerus caffer* survive in the wetland section protected in the Niokolo-Koba National Park. The park is the last refuge of the elephant in Senegal. Vervet monkeys are abundant in the gallery forest.
Human Impact & Utilisation: Traditionally, crops are cultivated on the floodplains immediately after the flood recedes each year, and cattle, sheep and goats are grazed there. The floodplains are also fished intensively. The Gambia River is navigable for over 100 km above the Gambian border.
Conservation Status: A small area of the wetlands on the upper Gambia and Koulountou Rivers is situated in the Niokolo-Koba National Park. Otherwise unprotected.

5. The Casamance Estuary
Country: Senegal
Coordinates: 12°21'-13°00'N/15°25'-16°50'W
Area: 360 000 ha (includes open water).
Altitude: sea level
Nearest Towns: Ziguinchor (on estuary); Dakar (235 km NNW)
General: The Casamance Estuary is another drowned valley at the mouth of which recent alluvium has formed a delta. It is situated close to the southern border in the wettest part of Senegal, where, although highly seasonal, mean annual rainfall exceeds 1550 mm/yr and the dry season is only 7 months long. The inlet is tidal for a linear distance of 165 km inland, and considerably more than this if measured along the centre of the main channel. In addition, tides penetrate far up several affluent valleys, notably those of the Tinkili, Baila and Soungrougrou streams, all on the north side. The main channel is 2.5 km wide at the mouth, then widens to 5 km and thereafter varies in width from 1-5 km for over 100 km. The delta area is almost entirely covered by mangrove forest, of which there is some 250 000 ha. Upstream of the mangroves there are palm-pandan and reed swamps, and areas of swamp forest subject to brackish/freshwater inundation depending upon the season. While these latter wetland types extend up estuary for over 165 km, the vast bulk of the wetland in the system is found within 60 km of the mouth.
On many small affluents on the north side, above tidal influence, and not continuous with the estuarine wetlands, there are narrow strips of seasonally inundated land. These are generally between 50 - 500 m wide, but extend in total length for hundreds of kilometres. They support floodplain grasses and gallery forests.

Hydrology: Principally marine and tidal, but with freshwater backup occurring in the rainy season and transmitting tidal influence extra far inland. Purely seasonal inundation occurs in the upstream sections of the minor affluents. The road at Dianah Malari, which crosses the head of the estuary 165 km inland, is 6 m asl.
Flora & Fauna: This is a mangrove estuary with areas of palm-pandan swamp, freshwater swamp forest, gallery forest, reed swamp, grass floodplain and some permanent ponds in the upstream sections. The flora is as described in the regional introduction. Cercopithecus mona and Hippopotamus amphibius occur here, the former often abundant in the mangrove trees. Up to 6000 pairs of *Pelecanus onocrotalus* breed on Kalissaye Island. Notable species in the mangroves are *Ardea goliath* and *Platalea alba.* Upstream, in the vicinity of Ziguinchor, *Ibis ibis* and *Pelecanus rufescens* nest in riverine trees.
Human Impact & Utilisation: A number of centres of population are situated on the periphery of the wetland area, e.g. Oussouye, Nyassia, Ziguinchor, Naiguisse, Diatta-counda, Sedhiou, Tanaff, Djindè, Marsassoum, Tanghory, Sindian, Bignona, Tendouck and Diouloulou. There is an estuarine fishery and an offshore fishery based in the estuary, which supply these towns. Mangrove timber is used locally for fuel and construction as virtually no real forest remains elsewhere in the district.
Conservation Status: Mostly unprotected, but the National Park de Basse Casamance, of 5000 ha, includes some of the wetland a few kilometres from the sea. The park contains mangrove areas, and bare saline mudflats, as well as terrestrial forest with Guinean species, and some wooded savanna. *Trichechus senegalensis* is present in the park. Dupuy (1971d) gives an account of the park. 16 ha at Kalissaye Point are protected in a bird sanctuary.

6. Minor Coastal Wetlands
Country: Senegal
Coordinates: 14°44'-15°39 'N/16°35'-17°25'W
Area: 4000 ha (total at low water)
Altitude: 1-4 m asl
Nearest Towns: Dakar (15 km SW); Saint Louis (100 km NE)
General: A series of small coastal lakes occurs to the north of Dakar in the Perimêtre de Reboisement des Niayes. The coast, from Cape Vert northeastwards, is an open sandy coast, subject to strong wave action and longshore drift. Behind the sand beach however, along the Perimêtre' the string of lakes extends for 120 km. The southernmost lakes are the largest, and they include Nhiarhol Pool, and Lakes Mbao, Mbeubeusse, Retba and Ourouaye. Lake Retba, which is the largest, has an open water surface 5 km long and 1.7 km wide at low water. The northern lakes are not named. The southern lakes are enclosed by vegetated zones subject to seasonal inundation, and at high water they may increase their areas fivefold. They all have a rich avifauna and harbour most of the small aquatic mammals associated with the region.