

Fraide & Pinto (1954) give some account of the distributions of birds both here and elsewhere in Mozambique, while Gaigher (1973) discusses aspects of the ecology of fish in the Limpopo River. A gastropod, Turritella sp., is especially common in the brackish marshes towards the river mouth. Malaria and schistosomiasis occur throughout the country, and the vectors of these diseases are ubiquitous in the wetlands.

8.5.g LAKES AND LAGOONS OF THE MOZAMBIQUE LOWLANDS

Some coastal lakes provide small fisheries, but they have not become centres for agricultural development. All lie on the coastal plain in the central and southern regions of Mozambique and experience climates similar to that described for regions 8.6 and 8.5.f. (see Fig. 8.2 Bela Vista). A list of the principal lakes and lagoons, with their areas, is given by the Direcção Provincial dos Serviços Hidráulicos, in 'Índice dos Rios, Lagos e Lagoas de Mocambique', Boletim da Sociedade de Estudos de Mocambique, 38: 158-159, 1969. Little scientific investigation has been made of the ecology of these lakes, but those that have connection with the sea appear to be essentially similar to Kosi Bay, described in section 8.6. However, one lake which has received some attention is Lagoa Poelala. This is a permanent water body reaching depths of 24 m with an area of up to 92 km² in some wet years. It has exceptionally clear water, and supports a luxuriant macrophyte flora down to 10 m. Accounts of its benthos and limnology have been given by Boltt (1975) and Hill et al. (1975) respectively.

8.6 THE MAPUTALAND COASTAL PLAIN AND THE KOSI LAKE SYSTEM

by J.S. MEPHAM.

Several important wetlands are situated on the Maputaland Coastal Plain of NE Natal and Zululand. A brief description of this plain is therefore given below, before the detailed accounts of the individual wetlands.

THE MAPUTALAND COASTAL PLAIN

In the Republic of South Africa much of northeastern Natal/Zululand is occupied by a coastal plain, (Figure 8.15), which in earlier times formed part of the sea bed. The plain is narrowly wedge shaped; its apex is in the south, and it attains a maximum width of 80 km in Mozambique to the north. To the east it is bounded by the Indian Ocean and to the west by the Lebombo Mountains, which in places reach an elevation of 600 m. Where the Lebombo Mountains end, at the latitude of Lake St. Lucia, the plain is only 30 km wide. In passing south it becomes much narrower, finally tapering away at the mouth of the Mlalazi River, where the old Cretaceous coastline meets the present one.

Much of this area comes under the jurisdiction of the KwaZulu Government. In the past this region has been referred to by a variety of names, including Tongaland, Amatongaland, British Maputaland and Northern Zululand. The preferred name now is Maputaland, but older literature includes the other names, and these alternatives are given where applicable.

THE COASTAL PLAIN OF NORTHEASTERN NATAL / MAPUTALAND

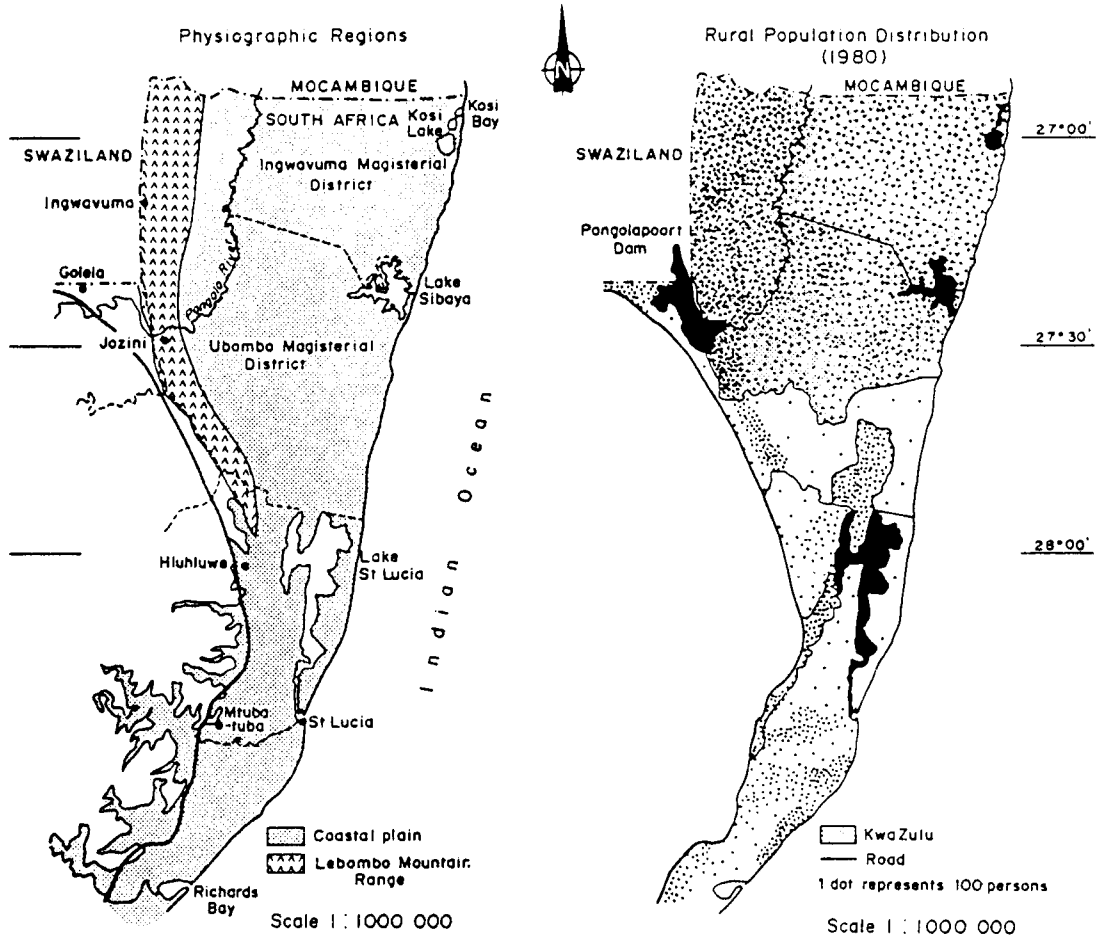


Fig. 8.15 Map of the Maputaland Coastal Plain showing physiographic regions and the distribution of the rural population in 1980

The Maputaland Plain is flat and hot, and is separated from the Indian Ocean by an almost continuous line of forested dunes about 350 km long between the Mlalazi Estuary in Natal, and Inhaca in Mozambique. These are among the highest, forested dunes in the world rising locally to over 180 m in height. The plain is predominantly covered by thornveld scrub, which becomes more sparse towards the north and away from the coast, reflecting trends of increasing temperatures and aridity in these directions. Climatically this plain is transitional between subtropical regions to the north and warm temperate lands to the south, and many tropical E. African plant and animal species reach their southernmost limits of distribution here.

Immediately behind the high coastal dunes a number of lake systems interrupt the plain, while inland the floodplain of the Pongolo River is associated with numerous ox-bow lakes and pans. In the south the St. Lucia System (8.9) consists of wide shallow lakes which drain via a narrow estuary to the sea. Further north lies Lake Sibaya (8.8), a deep, endorheic system, and close to Mozambique the lakes of the Kosi System drain into the Indian Ocean. Further inland, to the west of Kosi Bay, the Pongolo River (8.7) flows across the Makatini Flats to join the Usutu River, before it reaches the sea at the Bay of Maputo in Mozambique. Although these four systems are situated on the same coastal plain, they each show differences in morphometry, microclimate, fauna and flora, and therefore are dealt with separately in the following sections. However, there is little information available regarding either human activities or environmental management for the individual areas, so these points are considered together, later in this section.

1. Geology

The Lebombo Mountains consist of volcanic rocks, rhyolites and basalts, which began to be tilted eastward with the dissolution of Gondwana some 130 million years ago. Subsequent development of the Maputaland Plain to the east has been a consequence of three major marine transgressions, and the progressive but discontinuous activity of the Lebombo monocline. During late Cretaceous times the sea extended to the mountains and a series of marine sediments was deposited, comprising a basal layer of conglomerates, overlain by siltstones, sandstones, shales and limestones. Following uplift and extensive erosion during much of the Tertiary, another layer of conglomerates and sandy limestones was laid down during a Miocene transgression, which did not however, extend more than halfway across the early plain. Later, during the Pliocene a final transgression occurred, again inundating the full width of the plain, and covering the almost flat Miocene surface with a thin layer of calcareous sandstone. Since that time uplift has progressively expelled the sea and extended the coastline eastwards. Whenever sea level remained constant for any appreciable length of time a system of longshore dunes developed. The Maputaland Plain is now characterised by semiparallel lines of stranded dunes, between which the ground is in many places poorly drained and marshy.

2. Human activities and management

(a) Distribution and density of the human population: The Pongolo Floodplain and the Kosi Lake System both lie within the magisterial district of Ingwavuma, an area of 4147 km². During the 1980 census it was estimated that it had 96 238 inhabitants at a density of circa 23 persons per km². The distribution of these people is fairly uniform, except for a slightly higher concentration in the foothills of the Lebombo Mountains, and along the banks of the Pongolo River (Figure 8.15).

Lake Sibaya lies within the magisterial district of Ubombo, although approximately half its catchment area is in Ingwavuma. Again the population is fairly uniformly distributed with a slightly greater density in the west. It was estimated in 1980 that here 85 975 people occupied 4282 km², a density of about 20 persons per km².

Only a few hundred people live around most of the shores of Lake St Lucia, which are controlled by the Natal Parks, Game and Fish Preservation Board (usually referred to as the Natal Parks Board), the Directorate of Forestry and the South African Defence Force. However, the peninsula which separates the two northern arms of the lake, and a small area to the SE of the lake shore are, at present, part of KwaZulu, and in these two areas there is a population density of about 25 persons per km² (Figure 8.15).

There are no towns within the immediate environs of any of these wetlands. The villages of Ingwavuma and Jozini are in the hills 60 to 70 km from the coast, and both have populations of less than 1000. The town of St. Lucia has fewer than 5000 inhabitants, and lies at the mouth of the estuary well to the south of the lake. Thus the population of the Maputaland Plain is almost entirely rural, with a distribution of 20 to 25 persons per km². Ninety-five percent are Africans, who eke out a living by subsistence agriculture, supplemented where possible by hunting and fishing. Many of the men migrate to larger urban areas for much of the year, where they are usually employed as unskilled labourers.

(b) Development: At present the Maputaland Plain is almost entirely undeveloped. There are no towns or industrial areas, and apart from one major trunk road the majority of roads are unmetalled tracks. The Directorate of Forestry has a few plantations of pines and eucalypts near Lakes Sibaya and St. Lucia.

(c) Exploitation: The Pongolo Floodplain has in recent years suffered considerable disturbance and exploitation (8.7).

Lake Sibaya and the Kosi System have suffered little commercial exploitation and are largely undisturbed. The local inhabitants obtain fish by traditional methods such as basket trapping, and within the last ten years there has been a significant increase in gill-netting. Intensive agriculture is restricted by the lack of irrigation facilities and poor access to markets.

The St. Lucia Area has been exploited for tourism under the auspices

of the Natal Parks Board, which has designated special areas for recreation, accommodation and conservation. For further details see section 8.9.

At Kosi Bay the KwaZulu Bureau of Natural Resources operates a small nature reserve of 20 hectares, on the NW shore of Lake Nhlange. There is a campsite which is used by sporting fishermen, but access to the reserve requires a permit from the KwaZulu Government.

Mining: The coastal dunes are an important source of minerals including titanium, rutile and zircon. Extraction of these requires complete removal of the sand dune vegetation, and even with 'immediate' revegetation the pristine condition of the dunes is lost. Such deprivations could have a marked effect on the condition of the lakes. Some mining has already been carried out to the south of Lake St. Lucia, and further mining concessions have been granted on the Eastern Shores, and in strips running to the north and south of Lake Sibaya. Exploitation of the mineral reserves could have obvious benefit for the economy of the extremely impoverished areas of KwaZulu, and there is therefore a conflict of interest between raising the standard of living of some of the Zulu people and maintaining areas of intrinsic natural value.

(d) Management for disease and pest control: Malaria is endemic in this area and a programme of spraying dwellings with DDT has been in operation since the mid-1950s. Water bodies are not sprayed, but Begg (1980) reports that a certain amount of pollution occurs as a result of old insecticide containers being washed out in the rivers and streams. Bilharzia is prevalent, but there have been no reports of spraying with molluscicides. Typhoid fever and cholera present regular problems. Rabies and sleeping sickness are endemic in the area. The widespread use of herbicides has not been reported.

(e) Protective legislation: This region of South Africa is very attractive to tourists, and recent statistics have shown that many tourists are more interested in wild life and wilderness areas than in the more traditional tourist resorts. As mentioned in section (c) above, St. Lucia already has areas set aside for conservation. In addition, proposals have been made to increase its size and create a 'Greater St. Lucia-Mkuze Reserve'. Other proposals include a plan for a conservation area for the Pongolo Floodplain, and the creation of a Maputaland National Park, which will include all the areas dealt with in this section. Implementation of these plans may prove somewhat difficult, since preservation of large areas of the natural environment tends to imply preservation of the excessively low standard of living of the people of the area, many of whom think that the conservation areas will occupy potential agricultural land. However, the proposed plan for the Maputaland National Park does take into consideration the rôle of the people in the area.

Much of the foregoing information was kindly supplied by Mr A.M. Little (Chief Town and Regional Planner), Pietermaritzburg, Natal.

THE KOSI LAKE SYSTEM

The Kosi Lake System consists of a series of interconnected lakes, situated on the Maputaland Plain. It lies on the the border between Mozambique and South Africa, and opens via an estuary into the Indian Ocean. It appears that some consideration has been given to developing the estuary as a port, and while there are no publicised plans, this prospect remains an ever-present threat to the environment.

A report of this area is given in Begg, 1978.

1. Geography and morphology (Figure 8.16)

Location: 26°57'S to 27°11'S; 32°38'E to 32°53'E. The Kosi Lake system is located in the NE extremity of the magisterial district of Ingwavuma, in the Republic of South Africa, 2 km south of the Mozambique border. Part of Lake Zilondo (Zilonde) lies within Mozambique.

Area: Total area of pans, swamps, marshes and rivers is approximately 500 km², with a total catchment of 186 500 km².

Landscapes: The System is fringed by low dunes and the vegetation surrounding the lakes comprises saltmarsh, seasonal swamp forest and tidal forest.

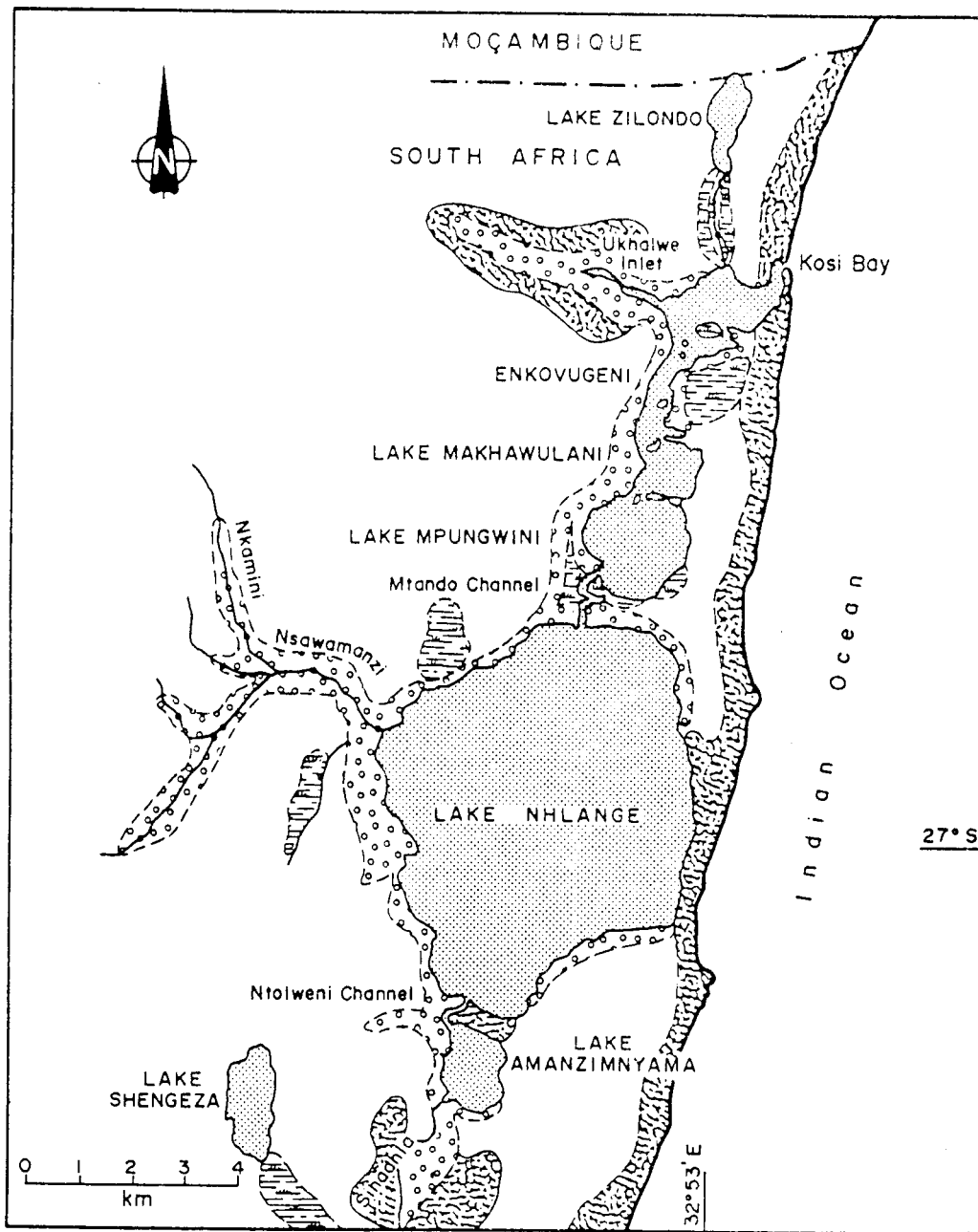
Morphometry: The system consists of a chain of roughly circular lakes orientated along an ENE/SSW axis.

Morphometry of the Kosi Lake System:

Main features from S to N	Area km ²	Axial Length km	Max Width km	Max Depth m	Mean Depth m	Volume km ³
Sihadhla River	-	-	-	1.5-3	-	-
Lake Amanzimnyama	1.5	-	-	2	-	-
Ntolweni Channel	-	-	-	-	-	-
Lake Nhlange	37	7.3	6.1	31	7.2	0.220
Mtando Channel	-	-	6-8	1-2	-	-
Lake Mpungwini	2.8	2.0	2.0	18	8.1	0.023
Lake Makhawulani	0.8	1.0	1.0	8	-	-
Enkovugeni	3.1	6	1.5	1-1.5	-	-
uKhalwe Inlet	0.16	1.5	0.1	3	-	-
Estuary	-	-	-	3	-	-

2. Climate

There is no specific information available, but it follows the general regional pattern of hot, wet summers (January) and cooler, dry winters (July). See sections 8.7 and 8.8 for more indication of the climate of the area.







- | | | | |
|---|---------------------|---|-------------------------|
|  | Coastal dune forest |  | Reed swamp |
|  | Open water |  | Swamp and tidal forests |

Fig. 8.16 Map of the Kosi Lake System

3. Hydrography and hydrology

Two principal rivers drain into the system. The Sihadhla rises in the Mtombeni pans, is about 30 km long and receives a network of tributaries before it enters Lake Amanzimnyama, while the Nswamanzi River which is about 15 km long, receives water from nine principal tributaries and enters Lake Nhlange on its western shore. The rivers drain through clean sands bringing very little silt to the lakes. The mouth of the estuary is usually open but varies in size with every tide, oscillating between widths of 5 and 100 metres. In August 1965 it closed and as a consequence of a cyclone the water level rose by 1.6 m during which time much of the mangrove community was killed. It remained closed until it was artificially opened in January 1966.

4. Physico-chemical characteristics of the water

Temperature: The lakes of the system are warm and show complex patterns of stratification. In the cool season the water is about 19°C and in the summer is about 30°C, rising to 39°C in the shallow regions.

Oxygen: Apart from the water in the hypolimnion of Lake Mpungwini, the waters of the Kosi system are well aerated. At the surface concentrations are 7.3–8.6 mg.l⁻¹ and at 10 metres 7.0–7.7 mg.l⁻¹.

	Conductivity 10 ⁻⁶ S.cm ⁻²	Transparency (Secchi disc) m	Salinity ‰
Lake Amanzimnyama	900	1	lowest 8.4
Lake Nhlange	4 000	1.2	0.9–4.2
Lake Mpungwini	8 000	3.7	shows layering
Lower Kosi	20 000	clear	
Enkovugeni	1 000	–	–
Lake Zilondo	800	0.6	–

Major ions (Lake Nhlange, 1967):

	Cool Season	Warm Season
Na	1846.0 mg.l ⁻¹	2450.0 mg.l ⁻¹
K	3.6 mg.l ⁻¹	–
Ca	52.8 mg.l ⁻¹	84.1 mg.l ⁻¹
Mg	101.0 mg.l ⁻¹	75.0 mg.l ⁻¹
HCO ₃	121.0 mg.l ⁻¹	144.0 mg.l ⁻¹
Cl	3.0 ‰	3.9 ‰
NO ₃ (surface)	16.0 10 ⁻⁶ g.l ⁻¹	74.0 10 ⁻⁶ g.l ⁻¹
NO ₃ (5–10 m)	52.0 10 ⁻⁶ g.l ⁻¹	63.0 10 ⁻⁶ g.l ⁻¹
PO ₄ (P)	+19.0 10 ⁻⁶ g.l ⁻¹	–
SO ₄	209.0 mg.l ⁻¹	–
SiO ₂	7.1 mg.l ⁻¹	–

5. Macrophytes

Submerged macrophytes are not very common in the lakes. Potamogeton pectinatus occurs in a stunted form at depths of 2 to 3 metres in the

margins of the more saline lakes (Boltt and Allanson 1975) and some Ceratophyllum demersum and Najas marina may also be found. Floating leaved macrophytes are represented by Nymphaea capensis and Nymphaea caerulea, which are found along the edges of the system. Emergents are found along the margins of the estuary including among others, the tall grass Phragmites australis, the fern Acrostichum aureum, and the sedges Cladium mariscus, Cyperus papyrus, Juncus kraussii and Scirpus litoralis. Swamp forests occur in pockets on parts of the lakeshore and along drainage channels leading to the lakes. Syzygium cordatum, Ficus trichopoda (= hippopotami), and the palm Raphia australis are found along the banks and streams of the system. The forest floor is covered by an abundance of ferns, and climbers such as Stenochlaena tenuifolia are conspicuous. In the tidal forest Bruguiera gymnorrhiza is probably the commonest arborescent species present, but Avicennia marina and Rhizophora mucronata are locally abundant in the seaward parts of the forest and along some drainage channels. Barringtonia racemosa and Hibiscus tiliaceus are also common and dominate some of the landward areas. Along the eastern side, and towards the mouth of the system, mangrove forest directly abuts dune vegetation at the limit of tidal influence, but on the western side the transition to terrestrial vegetation is more complex and interference has been greater. Over large areas of the forest, Bruguiera trees are stunted and bushy, growing as they do on predominantly sandy soils. The majority are less than 4.5 m tall, and many are dead, killed by a period of continuous flooding in the wake of a cyclone. They stand scattered, or in groups, as bleached silver trunks among the green of the living trees. However, along creeks on the eastern shores, Bruguiera trees have been measured as reaching 18 m in height. Two other mangrove species, Ceriops tagal and Lumnitzera racemosa, also occur here at the southern most limit of their distribution in Africa, but they are uncommon.

6. Phytoplankton

The most abundant alga is Microcystis sp., which is especially abundant in the uKhalwe inlet.

7. Invertebrates

The lake system is not rich in zooplankton. Hemens *et al.* (1971) found the greatest density on the eastern shore of Lake Makhawulani. Oliff *et al.* (1977) obtained a maximum of 3500 zooplankters per haul, comprising mainly the copepod Pseudodiaptomus hessei.

The density of benthic fauna decreases markedly with depth, and is particularly sparse where the bottom is muddy. Hemens *et al.* (1971) recorded 30 species of bottom dwelling animals. Forbes (1979) considers the sand prawn Callinassa kraussii to be the major infaunal organism of the system, although it is confined to Lake Mpungwini, Lake Makhawulani and the southern section of the tidal basin.

Hemens *et al.* (1971) recorded 28 epifaunal species among the marginal vegetation of the Mtando Channel and in the margins of Lake Nhlangwe.

The dominant species included Musculus virgiliae and various detritus feeding crustaceans (amphipods, isopods and tanaids).

8. Fish

Blaber (1978) has listed 133 species of fish present in the Kosi system including 85 marine species found in association with the reef at the mouth, or which penetrate the tidal basin, 39 resident estuarine species which penetrate the system beyond the tidal basin, and 9 fresh water species. The Kosi system is considered as a prime fishing resort and the estuary appears to fulfil an important nursery function, as juvenile fish mature there before migrating back to the sea (Wallace et al. 1971; Heydorn 1972; Heydorn and Wallace 1973).

9. Other vertebrates

Reptiles: Crocodiles are not common in the Kosi System, and are restricted to the fresh water lakes Zilondo and Amanzimnyama. Three species of semi-aquatic snakes have been recorded by Bruton and Haacke (1975).

Birds: Birdlife is prolific in the Kosi area, although more are associated with the surrounding forests than the water. Tinley (1976) has listed 247 different species. No single species is outstanding in terms of its abundance, but several are at their southern most limit in Africa, and a few species are rated 'rare' in South Africa (including crab plovers, fishing owls, flufftails and white backed night herons).

Mammals: The hippopotamus population appears to have increased from 19 in 1958 (Tinley 1971) to 31 in 1980 (Begg 1980). They are found mainly in Lake Amanzimnyama.

8.7 THE PONGOLO RIVER FLOODPLAIN

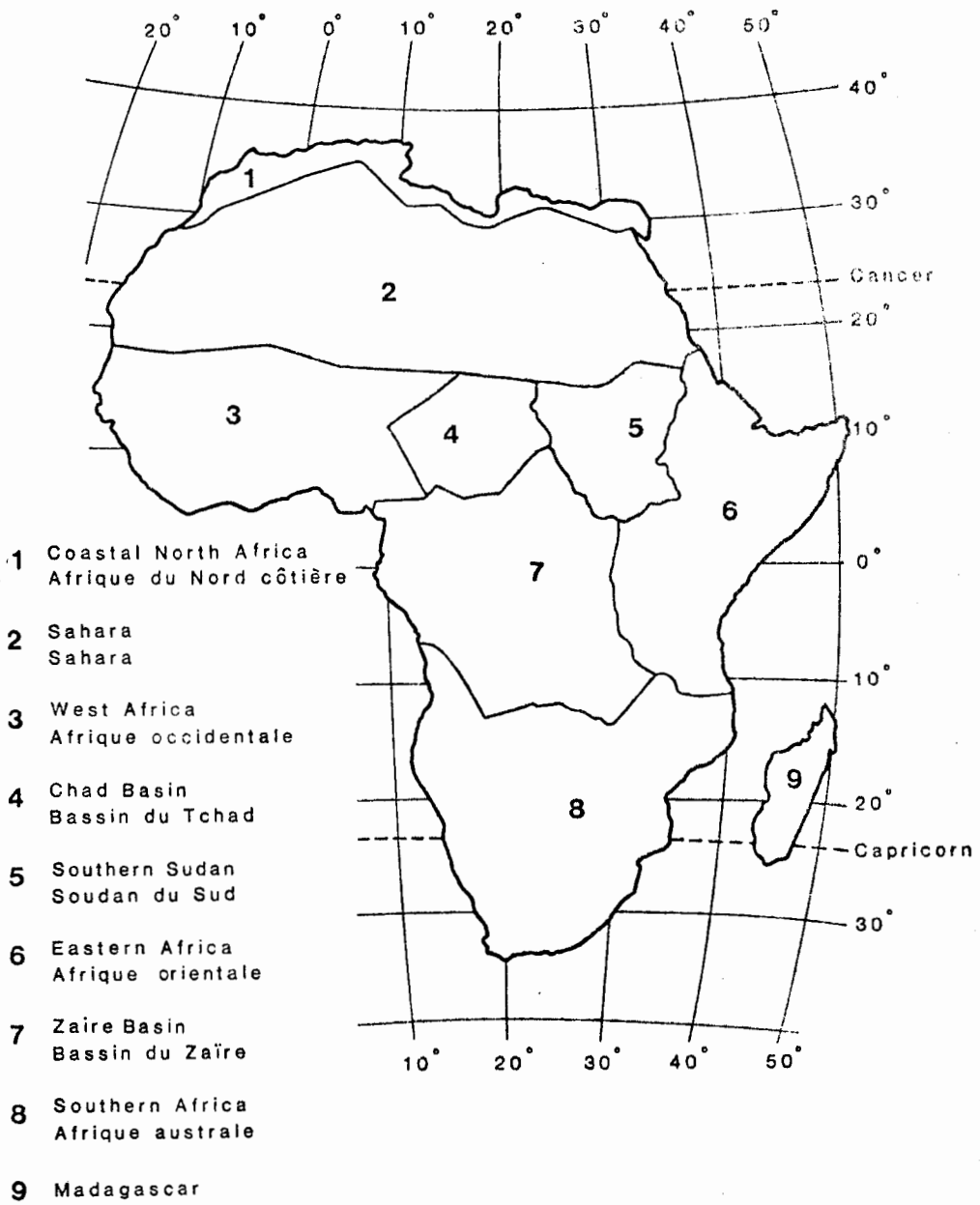
by J.S. MEPHAM

The Pongolo Floodplain lies at the eastern foot of the Lebombo Mountain Range, on the Maputaland Coastal Plain of South Africa. It comprises a low lying area of approximately 1200 km² immediately adjoining the Pongolo River, and includes seasonally flooded land, marshes and floodplain pans which capture and retain floodwater when the river overflows its banks.

A comprehensive account of this region is given by Heeg and Breen (1982).

1. Geography and morphology

Location: 26°45'-27°30'S; 32°20'-32°33'E. The floodplain of the Pongolo River is situated about 80 km inland from the Kosi Lake



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Régions d'Afrique traitées dans le présent répertoire

DIRECTORY
REPERTOIRE



**African wetlands
and shallow water bodies**

**Zones humides
et lacs peu profonds
d'Afrique**

M. J. BURGIS
J. J. SYMOENS



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