

# The lower Orange River

B.J. VAN ZYL

Fresh Water Fish Institute, Private Bag 2020, Mariental, Namibia

Received April 1989, accepted August 1989

## ABSTRACT

The total catchment area of the Orange River is approximately 852 000 km<sup>2</sup> (47% of the total surface area of South Africa), and is the largest regulated river system in South Africa. Due to man's interference with this river system, remarkable changes in its ecology have taken place. Furthermore, wetlands associated with irrigation were formed in the river beds. Little is known about the ecology of these wetlands. Two alien snail and fish species occur in the system, and five endemic fish species are known, of which two are listed in the latest publication of the SA Red Data Book. Several birds of conservation significance occur in the lower Orange River system.

## INTRODUCTION

The Orange River with a total length of 1 950 km is the longest river in southern Africa, south of the Zambezi (Keulder 1979). It rises in the mountains of Lesotho and flows westwards through the semi-arid and arid southern Orange Free State and northern Cape into the Atlantic Ocean at Alexander Bay. The total catchment area of the Orange River is approximately 852 000 km<sup>2</sup>, 47% of the total surface area of South Africa (Benade 1988; Figure 1). According to Benade (1988) this drainage totals 22,1% of the average rainfall run-off of the country.

## REGIONAL ACCOUNT

According to Benade (1988) the catchment area of the Orange

River system is naturally divided into three sections:

- Upper Orange - from the origin to the Orange-Vaal confluence
- Middle Orange - from the confluence to Augrabies Falls
- Lower Orange - from Augrabies Falls to the river mouth

Although the catchment area of the lower Orange River covers a large area, the annual rainfall is low. It is estimated that the catchment area of the lower and middle Orange River provides only 1,8% of the annual flow of the Orange River (Benade 1988).

The total catchment area of the Fish River, the main tributary of the lower Orange River, is approximately 80 300 km<sup>2</sup> (Department of Water Affairs 1978). The Fish River derives its

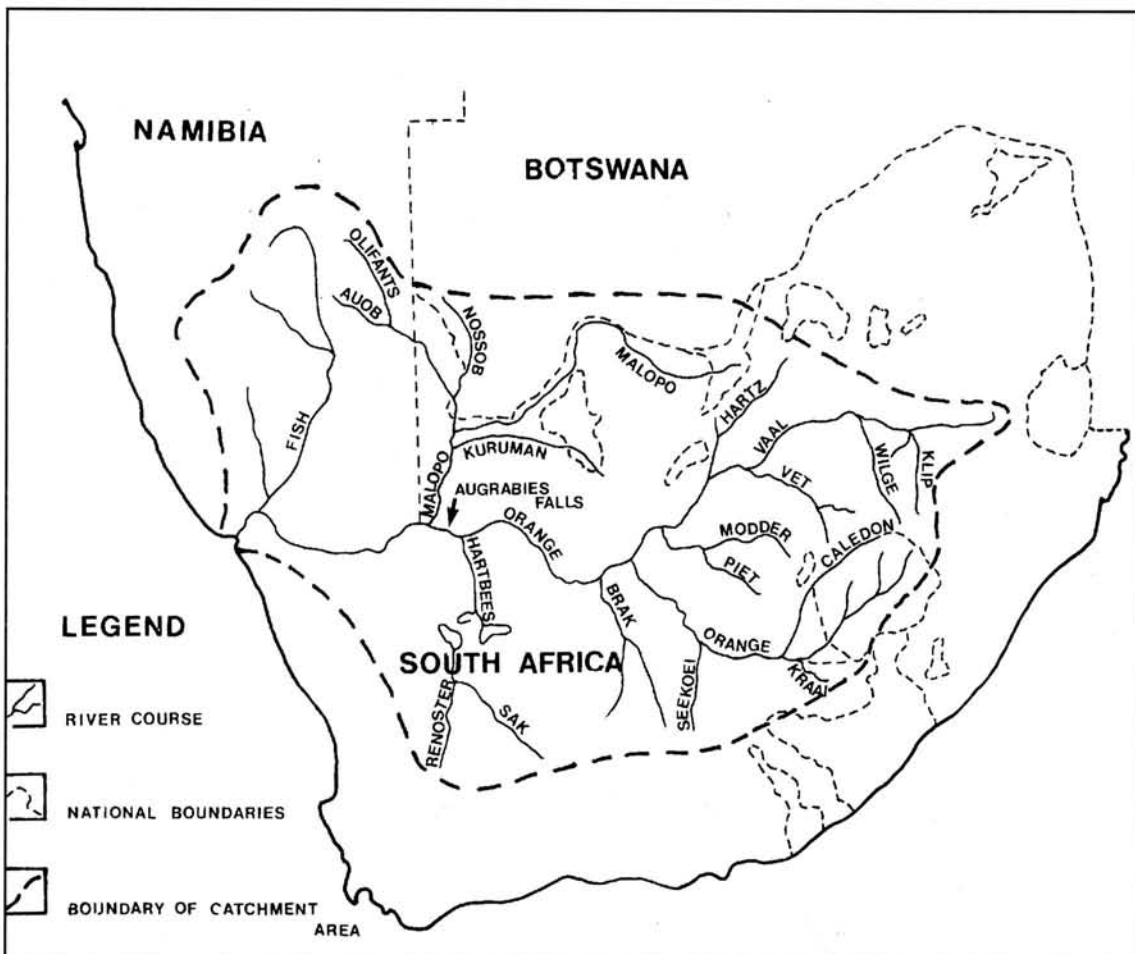


FIGURE 1: The Orange River system catchment (after Benade 1988)

headwaters mainly from the Nauchas highlands in the western part of Rehoboth. It flows southwards parallel with the coast over a distance of 804,7 km and joins the Orange River at a point approximately 112,7 km from the river mouth (Simpson & Davies 1956).

Several dams were built in the Orange River system and as a result the Orange River is the most regulated system in South Africa (Table 1: Benade 1988).

TABLE 1: Major dams in the Orange River system

Dam	River
Allemskraal	Sand
Bloemhof	Vaal
Boegoeberg	M. Orange
Erfenis	Vet
Grootdraai	Vaal
Hardap	Fish
Hendrik Verwoerd	U. Orange
Kalkfontein	Riet
Koppies	Renoster
Krugerdrift	Modder
Mockes	Modder
Naute	Löwen
P.K. le Roux	U. Orange
Rustfontein	Modder
Smartt Syndicate	Brak
Spitskop	Hartz
Sterkfontein	Wilge
Tierpoort	Kaffer
Vaal	Vaal
Vaalhartz Weir	Vaal
Van Wyksvlei	Carnar, pans
Welbedacht	Caledon

According to Benade (1988), seen from an ecological point of view the aquatic and semi-aquatic macrophyte encroachment, which form wetlands in the river beds, can be seen as nature's reaction to man's interference with the system. These wetlands are normally associated with irrigation areas which occur along the river and beneath the Hardap Dam. Based on the number of birds supported by the Orange River mouth area, Williams (1986) states that it is the sixth most important coastal wetland in southern Africa. No literature, however, could be found on the ecology of these wetlands.

According to Benade (1988) the major floods drain over a period of 2-3 months which also serve as a spawning migration stimuli to the riverine fish and spawning occurs in flowing waters or in the inundated shore areas. These floods have been shortened by man's interference to 2-3 weeks ("flash" floods), causing thousands of the system's breeding stock to be stranded and die in the breeding areas (Benade 1988). According to Noble and Hemens (1978) the Orange River forms a river mouth where it meets the sea.

## DOMINANT ABIOTIC FACTORS

### Rainfall

Benade (1988) reports that the rainfall in the catchment area is erratic and consequently so is the streamflow. Under natural conditions, 25% of the system's runoff occurs between May and

October, with the minimum flow during August and 75% between November and April with a maximum during March (Benade 1988). The flow regime changed to a 46% winter and 54% summer pattern due to man's interference (Benade 1988). The maximum flow for one hydrographic year, October 1924 to September 1925, was  $19432 \times 10^6 \text{ m}^3$  (163% of the average) and the minimum, October 1948 to September 1949, was  $1275 \times 10^6 \text{ m}^3$  (11% of the average: Benade 1988).

## DOMINANT BIOTIC FACTORS

### Vegetation

Desert and succulent steppe, and dwarf savanna are characteristic veldtypes of the lower Orange River system (Van der Merwe 1983). *Phragmites* reed beds occur below Hardap Dam and in the Orange River.

### Wildlife

Fish species endemic to the lower Orange River system are *Barbus aeneus* (smallmouth yellowfish), *Barbus kimberleyensis* (largemouth yellowfish), *Barbus hospes* (Namaqua barb), *Labeo capensis* (Orange River labeo) and *Austroglanis sclateri* (Rock-catfish: Cambrey 1984). Only two fish species *Barbus hospes* and *Austroglanis sclateri* are listed as rare in the Red Data Book (Skelton 1987). Two alien invasive fish species *Oreochromis mossambicus* (Mozambique tilapia) and *Cyprinus carpio* (common carp) occur in the lower Orange River.

A resident breeding colony of white pelicans *Pelecanus onocrotalus* occurs at Hardap Dam and according to Schrader (1986) the average monthly number of pelicans between 1981 and 1984 was 442. Birds with conservation significance which occur at Hardap Dam, Naute Dam and the Orange River mouth are *Leptoptilos crumeniferus* (marabou stork), *Ardea goliath* (goliath heron), *Ciconia nigra* (black stork), *Spheniscus demersus* (jackass penguin), *Podiceps nigricollis* (blacknecked grebe) *Morus capensis* (Cape gannet), *Charadrius pallidus* (chestnutbanded plover), *Larus cirracephalus* (greyheaded gull), *Larus hartlaubii* (Hartlaub's gull), *Sterna bergii* (swift tern) and *Sterna balaenarum* (Damara tern). According to Williams (1986) many wetland birds are to be found on the wetlands of the southern river bank at the Orange River mouth. The protected Cape clawless otter *Aonyx capensis* also occurs in the Orange River.

## CONSERVATION PROBLEMS

Despite the warnings of prominent scientists, the Orange River system still does not receive the attention it deserves as the largest and most regulated lotic system in south Africa. It is unfortunate that there is very little useful base-line data available on the lower Orange River. The Cape Department of Nature and Environmental Conservation therefore formed a multidisciplinary pilot committee in August 1986 (Benade 1988). According to Benade (1986) the major objective of the committee is to determine the minimum waterflow requirements, on a seasonal basis, for the biological component of the system, in order to re-establish and maintain the ecological balance of the Orange River System.

## CONCLUSION AND FUTURE ACTION

Since the boundary between Namibia and South Africa is the high water mark on the Namibia side of the Orange River, the major responsibility for monitoring of the Orange River is that of South Africa.\* This does not exclude the Ministry of Fish-

eries from sharing responsibility of ensuring that no alien fish species enter the Orange River. It would be beneficial to the lower Orange River ecosystem if regular contact between the Departments of Nature Conservation of Namibia and the Cape Provincial Administration could be established. The existing control measures to prevent the spread of *Oreochromis macrochir* (greenheaded bream) and *Tilapia rendalli* (redbreasted bream) from the Freshwater Fish Institute at Hardap must be maintained. *O. macrochir* and *T. rendalli* are originally from the Kavango River and are not endemic to the Orange/Fish River system. A monitoring program of the Fish River, from Hardap Dam to the mouth of the Orange River should be established.

## REFERENCE

- BENADE, C. 1986. Development of a project to determine the minimum waterflow requirements of the biological component of the Orange river. *Annual congress of the Limnological Society of Southern Africa*.
- BENADE, C. 1988. Episodic flood events in the Orange River system- and ecological perspective. CSIR.
- CAMBRAY, J.A. 1984. Fish populations in the middle and lower Orange river, with special reference to the effects of stream regulations. *J. Limnol. Soc. sth. Africa* 10: 33-36.
- DEPARTMENT OF WATER AFFAIRS 1978. Die Visrivieropvanggebied verdeling van die oppervlaktewaterpotensiaal tussen die onderskeie etniese gebiede. Report no. 490/23/1. December.
- KEULDER, P.C. 1979. Hydrochemistry of the upper Orange River catchment. *J. Limnol. Soc. sth. Africa*. 5: 1-4.
- NOBLE, R.G. & HEMENS, J. 1978. Inland water ecosystems in SA. CSIR.
- SCHRADER, H.J. 1986. \*n Ondersoek na die potensiële, maksimale, volgehoue visopbrengs van Hardapdam en die moontlike invloed van kommersiële ontginning op hengel en visvretende voëls. M. Sc thesis. U.O.V.S.
- SIMPSON, E.S.W. & DAVIES, D.H. 1956. Observations on the Fish river canyon in South West Africa. *Transactions of the Royal Society of South Africa*. Vol. XXXV (Part II).
- SKELTON, P.H. 1987. South African Red Data Book - Fishes. *South African National Scientific Programmes Report* no. 137.
- WILLIAMS, A.J. 1986. Wetland birds at the Orange River mouth and their conservation significance. *Bontebok*, 5: 17-23.
- \* Added in press: On 24 May 1991 the Minister of Foreign Affairs for Namibia announced that an agreement had been reached between his government and the Republic of South Africa to accept the centre of the Orange River as the international border between the two countries.