The importance of weirs as refugia for hippopotami and crocodiles in the Limpopo River, South Africa

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Abstract

The distribution of the South African Red Data species hippopotami and crocodiles along the Limpopo River is discussed in relation to the factors affecting their survival. The severe modifications of this river and its tributaries are responsible for a conservation dilemma. On the one hand such modifications have contributed to the drying-up and impoverishment of the system, but on the other hand permanent water behind storage weirs has been provided, enabling most aquatic biota to survive, particularly in times of drought. The importance of these weirs in the main channel of the Limpopo River is discussed in comparison to the contribution made by natural pools towards the survival of hippopotami and crocodiles. Fifty per cent of the former and 72% of the latter occurred along those stretches of river where weirs are prevalent. Problems and possible solutions to safeguard the survival of these species along the Limpopo River are discussed.

Introduction

The conservation of all biota is dependent on the quality and quantity of the habitat. Due to the low rainfall and sporadic but severe droughts in South Africa, its rivers are amongst the most limited and threatened habitats. These naturally adverse conditions have been exacerbated by the various demands placed on the rivers by a burgeoning human population. South African rivers have been extensively degraded (Huntley, 1978; O'Keefe et al., 1989) influencing the survival of aquatic biota such as fish (Skelton, 1987), hippopotamus *Hippopotamus amphibius* (Smithers, 1986) and the Nile crocodile *Crocodylus niloticus* (Jacobsen, 1988). Both of the latter species are listed in the South African Red Data Books, the former as rare (Smithers, 1986) and the crocodile as vulnerable (Jacobsen, 1988). These species still occur in the Transvaal, but their continued survival outside of the Kruger National Park is now precariously dependent on an adequate supply of water and an assured food supply.

The Limpopo River is one of the largest rivers of the Transvaal and forms the border between the Republic of South Africa and its northern neighbours. The large-scale abstraction of water from the system was enhanced through the construction of weirs and dams in its catchment and has had a negative impact on the flow regime of this river. Weirs, primarily for storage purposes, have also been constructed in the main river channel. These are now perhaps vital for the continued survival of aquatic biota including hippopotami and crocodiles in large sections of an otherwise very impoverished system. The purpose of this study was to assess the importance of these weirs as refugia for these animals.

The study area

The study area comprises the Limpopo River from the confluence of the Crocodile and Marico Rivers (900 m a.m.s.l.) for a distance of 645 km to the western Kruger National Park border (200 m a.m.s.l.). The most important South African tributaries of the Limpopo are the Crocodile, Marico, Mokolo, Lephalala, Mogalakwena and Sand Rivers while the Notwane and Motloutse Rivers contribute flow from Botswana and the Umzingwane and Bubye Rivers from Zimbabwe. The Shashe River, which forms part of the border between Botswana and Zimbabwe, is the largest tributary of the Limpopo (Fig. 1).

Despite its large catchment and numerous tributaries, the Limpopo is a highly seasonal river with 90 % of the mean annual runoff (MAR) occurring during the months of December to April. Flow during October, November and May to September is extremely erratic and low with no-flow conditions occurring mostly during these months. The longest recorded period of flow in the river at Beit Bridge is 8 months and the shortest, 2 months. The MAR at Beit Bridge has been estimated at 1 904,77 x 10^6 m^3(min. = 35 x 10^6 m^3; max.= 6 876 x 10^6 m^3) (Nel, 1989).

Precipitation is the highest in the southern section of the catchment (600 to 800 mm/a), decreasing to the northwest (400 to 600 mm/a) and reaching a low along the northern parts of the Limpopo Valley (200 to 400 mm/a). Evaporation varies from 1 800 to 2 000 mm/a in the southern parts to 2 000 to 2 200 mm/a in the northern parts of the Limpopo Valley (Anon, 1986).

Downstream from the confluence of the Crocodile and Marico Rivers, the Limpopo flows in a deep channel of 30 to 50 m wide with tall trees (predominantly *Acacia karoo, Faidherbia albida* and *Combretum erythrophyllum),* shrubs and grass lining the banks. In the dry season pools are found on the outside of bends in the river, most of which are ephemeral. The river bed in this area consists mainly of sand and mud. Crocodiles and hippopotami are found along this stretch (Jacobsen, 1984). Downstream from this point and particularly after the confluence with the Mokolo River, the Limpopo gradually widens to 40 to 60 m and the banks are less steep. Well-vegetated islands occur sporadically along the river. Although the river bed still consists mainly of sand, many permanent pools form behind natural flow barriers, like fault lines and dykes, which traverse the river and provide a habitat for crocodiles and hippopotami, e.g. an extensive rocky bed area with pools found for some distance downstream from the confluence with the Mogalakwena River. In addition to forming pools when the river flows, these natural flow barriers also cause water in the sand bed to rise to the surface during the no-flow season. Riparian vegetation along this river section consists mainly of tall trees *(F. albida, Ficus sycomorus* and *C. erythrophyllum),* shrubs, grass and sporadically occurring reed patches *(Phragmites* spp.). The Limpopo maintains these characteristics up to its confluence with the Motloutse River. From here to the confluence with the Shashe River the Limpopo widens to 60 to 80 m in width and pools formed

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