

SHORT NOTE

Habitat ecology of black storks
in the Kuiseb River

by

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As an adjunct to a study on the ecology of water-pools in the Kuiseb River Canyon of South West Africa we noted the presence of a small, and perhaps resident, population of black storks, *Ciconia nigra*, wading in pools that were being monitored on a monthly basis. The extension of the black stork's distribution into this desert canyon is attributed to the seasonal decline in size of water-pools and corresponding concentration of fish and amphibians living in them. Other contributing factors include the lack of competition for these resources, the isolation from human disturbance, and the abundance of suitable roosting and nesting sites on canyon walls.

The black stork is a common Palaearctic migrant to parts of northern and eastern Africa, but in southern Africa it is a relatively uncommon year-round resident that is widely dispersed throughout its range (Siegfried, 1967; Moreau, 1972). The estimated 100 black storks resident in southern Africa apparently only breed in isolated mountainous regions of the subcontinent where permanent water is available, namely the Drakensberg escarpment of South Africa and the rocky hills and mountains of central Rhodesia (Siegfried, *op. cit.*; Siegfried *et al.*, 1976). In South West Africa only a few isolated observations of black storks have been reported in the last two decades, most of these being of solitary birds (Table 1). Given the unconfirmed reports of black storks breeding in the Kuiseb River Canyon (Siegfried, *op. cit.*; Tuer, 1977), we present here our notes on black storks in the canyon between 1976 - 1978.

TABLE 1: Observations of black storks in South West Africa.

Date	Site	No.	Source
Jan. 1950	Ai Ais (Fish River)	3	MacDonald 1957
Feb. 1950	Voigtsgrund Dam	3	MacDonald 1957
— 1970	Daan Viljoen	1	C. Clinning, pers. comm.
Oct. 1970	Daan Viljoen	1	C. Clinning, pers. comm.
Dec. 1975	Etosha National Park	1	C. Clinning, pers. comm.
Mar. 1976	Farm Sandmodder (Karas Mountains)	1	C. Clinning, pers. comm.
May 1977	Bullspoort (Naukluft Escarpment)	1	C. Clinning, pers. comm.
—	Waterberg	—	Winterbottom 1971

The Kuiseb River, with its origins in the Khomas Hochland, has incised a deep narrow canyon of about 75 km in length on its westward flow through the Namib Desert to the Atlantic Ocean. In the canyon, which starts about 40 km east of Gobabeb (23°34'S, 15°03'E), there is virtually no vegetation, but the sandy canyon floor has a number of small, isolated water-pools. Although usually dry, the Kuiseb floods almost every year following seasonal rains in the

escarpment between December and March. Floods past Gobabeb may last from 1 – 102 days (\bar{X} = 33, S.D. 29 days, 1962 – 1976), but minor flows continue for several more months in the canyon area. After the floods recede the water table gradually drops, confining accessible water to isolated and irregularly spaced pools. Water-pools in the lower parts of the river near Gobabeb dry more rapidly than those farther up-river, and those in the canyon persist throughout the year (Table 2).

TABLE 2: The decline in number and approximate size of water pools in the Kuiseb River Canyon through the dry season. Locations of pools are clumped into four separate regions, defined by their distance (km) up-river from Gobabeb: V = Kuiseb River Valley (Km 0 – 35); L = Lower Kuiseb Canyon (Km 36 – 75); M = Middle Kuiseb Canyon (Km 76 – 120); U = Upper Kuiseb Canyon (Km 121 – 155). The narrow, inner canyon (M) was censused twice on foot. The canyon flooded on 27 January 1978 and the flood-waters reached Gobabeb on 9 February 1978.

Date	Number of water pools				Surface area (m ²)			
	V	L	M	U	V	L	M	U
1977								
Aug.	11	62	—	50	92	4,025	—	1,694
Sep.	12	64	—	36	48	562	—	1,016
Oct.	10	63	—	22	11	473	—	656
Nov.	9	39	334	18	5	185	6,446	413
Dec.	7	23	—	17	<1	119	—	334
1978								
Jan.	4	23	163	8	<1	31	4,182	185

Individual black storks have been observed as far down-river as Gobabeb in August (1977) and May (1978), but their general distribution is confined to the canyon areas 45 – 140 km up-river. Except for the flood period (March – May) when the canyon is inaccessible for censusing, black storks have been observed in every month (1976 – 1978). Whether they remain in the canyon during the floods or move elsewhere is unknown, but the generally sporadic records of individual birds observed in other parts of South West Africa during these periods suggest that adults do not disperse, although one or two young birds may (Table 1). Single birds or small groups, apparently family units, are the rule, with a mean of 2.0 ± 1.2 , $N = 132$ (Table 3). From our census data, gathered by two observers censusing the upper 35 km and lower 75 km of the Kuiseb River on the same day, we estimate there are at least 13 black storks inhabiting the canyon. If the census data for other parts of southern Africa are correct (Siegfried, 1967), this represents about 12 % of the entire black stork population in the subcontinent.

In November 1977 a newly fledged stork, distinguished by its yellow bill, dull brown plumage and slightly smaller size, was observed accompanying two adult storks, presumably its parents. This immature bird could only fly short distances of 75 – 100 m before settling again, suggesting it had just left its nest.

This indicates a breeding date of June – July, which corresponds well with breeding dates of black storks elsewhere in the subcontinent (Siegfried, 1967). In July 1978 two pairs of adults were observed courting, but their nesting sites were not found. Another breeding record in the Maltahöhe district noted that four eggs were laid in September (C. Clinning, personal communication).

TABLE 3: Flock size of black storks in the Kuiseb River Canyon.

Number	Frequency	Percent
1	60	45,4
2	34	25,8
3	25	18,9
4	7	5,3
5	5	3,8
6	—	—
7	—	—
8	1	0,8

The presence of black storks in the Kuiseb River Canyon is almost certainly linked to the gradual decrease in size of water-pools and the availability of fish and amphibians living in them. Three species of fish (*Sarotherodon mossambicus*, *Cyprinus carpio* and *Barbus anoplus*) and at least three amphibians (*Xenopus laevis*, *Bufo vertebralis* and *Tomopterna delalandi*) are found in the pools. The most abundant of the above, and the most important food item for black storks, is *S. mossambicus*. In November 1977 all fish were removed from five different pools. *S. mossambicus* accounted for 89,1 %, *C. carpio* 9,3 % and *B. anoplus* 1,7 % of the total 758 fish captured (specimens smaller than 2 cm were excluded). In two of the pools *X. laevis* tadpoles were noted but not counted; the other three pools had no large vertebrate species other than fish. In a separate count of a sixth pool measuring 18 × 10 m, 863 fish, all of them *S. mossambicus*, were netted, measured to the nearest mm, then replaced. One month later (January 1978) the pool, then measuring 15 × 9 m, was recensused. About half the fish were missing, especially the larger size classes (120 – 280 mm), suggesting that selective predation by black storks may be operating (Fig. 1). During the same period, the number of *X. laevis* adults sampled decreased from 29 to 5. Elsewhere (Tilson and Kok, in preparation) we show that there is a significant decline in the size of water-pools in the Kuiseb River as the dry season progresses, but the area most preferred by black storks (the inner canyon) is where most of the small permanent water-pools are located (Table 2).

Black storks are restricted in their breeding and post-breeding dispersal to suitable aquatic food resources. Siegfried (1967) pointed out that in spite of the abundant mountainous terrain and permanent streams of the south-western Cape, which would seemingly be an ideal nesting habitat, black storks do not breed there because

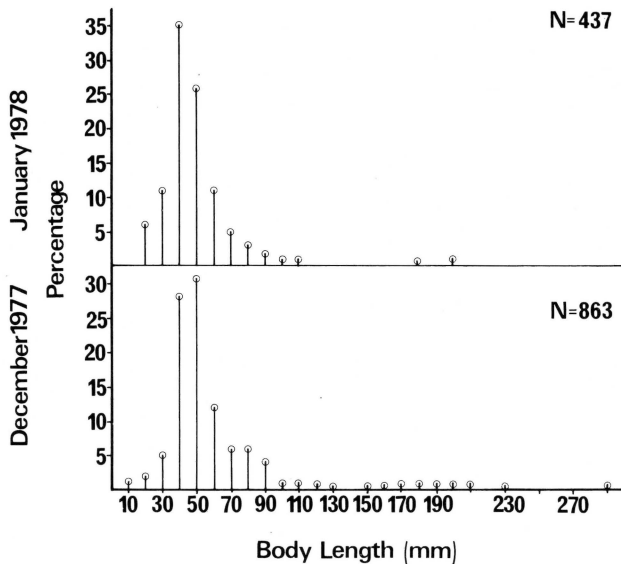


FIGURE 1: The decline in number and size classes of *Sarotherodon mossambicus* in a Kuiseb River Canyon water pool.

at the time the young need to be fed the rivers and vleis are swollen and the fish dispersed. Elsewhere Kahl (1964) has shown that declining water levels, and a corresponding increase in the availability of food items, is the proximal basis for breeding in wood storks, *Mycteria americana*, and that post-breeding dispersal coincides with periods of high-water levels. This is precisely the relationship between black storks and water-pools in the Kuiseb River Canyon. Our censuses show that there are year-round pools in the Kuiseb (except during floods) that contain an abundant, though species poor, population of fish-fauna, notably *S. mossambicus*. These pools are situated in a relatively isolated and undisturbed section of the canyon, close to steep rocky walls that provide ideal nesting sites. The seasonal floods do not occur until after January, long after the time young birds have fledged.

Prior to this is a period when food resources become easily accessible and sufficiently abundant to support this small population of black storks.

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