Freshwater fishes of Namibian wetlands - a review

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Received January 1989 ; accepted July 1990

ABSTRACT

The number of freshwater fish species present in all known locales in Namibia are given with the proportion of species associated with each wetland. Approximately 75% of all riverine species are associated with floodplains, of which only three endemics and six Red Data species are floodplains species. At present, three alien species which are threatening to indigenous species occur in Namibia. The duration and timing of flooding determines to a large extent the recruitment, growth and survival rates of the wetlands fish stock. Besides stimulating breeding and providing shelter for the young, increased water levels result in a nutrient pulse into the aquatic system. It is proposed that the ecology of *Barbus hospes* be studied and that the habitat of the *Nothobranchius* species be protected. A grid-screen should be installed over the draw-off point of the ENWC Rundu to prevent fish entrainment. The waterlevel of the Cunene River should be stabilised during the fish breeding season to ensure recruiting success.

INTRODUCTION

The perennial rivers of Namibia are the Cunene, Kavango and Orange and those in the eastern Caprivi namely the Kwando-Linyanti-Chobe River System and the Zambezi River and its floodplain. There are 68 fish species in the Cunene (Penrith 1982), 73 in the Kavango (Skelton et al. 1984), 17 in the Orange (Scott & Hamman 1984), 76 in the eastern Caprivi (Van der Waal & Skelton 1984), 43 occured in Lake Liambezi (Van der Waal 1976) but the lake has since dried up, and 44 in the Cuvelai drainage system (Van der Waal 1984). In years of good rainfall this river system slowly fills the 100 km wide Oshana Delta in Owambo, eventually converging to Lake Opono and via the Ekuma River into Etosha Pan from which five euryhaline (i.e tolerant of high salinities) species were collected by van der Waal (1984).

Dixon & Blom (1974) colleced four species at various localities in the Namib Desert of which one, *Hepsetia breviceps*, is an estuarine fish. An isolated population of *Clarias cavernicola* is endemic to the Aigamas cave and *Telapia guinasana* is endemic to lakes Otjikoto and Guinas. The number of species present in the bigger state dams which are administered by the Ministry of Wildlife, Conservation and Tourism are given in Table 1.

Number and proportion of freshwater fishes associated with wetlands

An important component of the fish community is the riverine species which use floodplains as nurseries (Bruton & Jackson 1983). Table 2 shows the number of species in the major rivers of Namibia and the approximate proportion of riverine species that are associated with floodplains.

TABLE 2: Number of riverine species and the proportion associated with floodplains in Namibia.

Wetland	Total number of species	Associated with floodplains (%)
Cunene River	54	79.0
Kavango River	73	64.7
Orange River	9	53.9
Eastern Caprivi	59	77.6
Cuvelai System	39	88.6

The Kavango River has the richest fish species diversity (73 species) followed by the Zambezi system (59 species), the Cunene River (54 species) down to the Orange River with only nine species. Bruton & Merron (1983) described the characteristics of some typical wetland fishes which were used to calculate the approximate percentage of the fishes associated with wetlands for each system in Table 2. The results show that (the Orange River excluded) 77,6% and more of all the fish species in the other river systems are typical floodplain fishes.

TABLE 1: Fish species present in State dams in Namibia

Species	Hardap	von Bach	Swakoppoort	Omatako	Naute	Friedenau
Barbus aeneus	X					
Barbus kimberleyensis	X					
Barbus paludinosus	X					
Labeo capensis	X				X	
Labeo umbratus	X					
Mesobola brevianalis	X					
Cyprinus carpio	X	X				
Clarias gariepinus	X	X		X	X	
Micropterus salmoides		X				X
Tilapia sparrmanii		X	X			X
Tilapia rendalli rendalli			X			
Oreochromis macrochir			X			
Oreochromis mossambicus	X	X	X	X	X	X

Number of endemics or near endemics

The striped killifish, *Nothobranchius* species, the cave catfish, *Clarias cavernicola*, and the Otjikoto tilapia, *Tilapia guinasana*, are the only endemic fishes associated with wetlands in Namibia.

Red Data Species

According to Skelton (1987) there are six red data or potential red data fish species which are associated with wetlands in Namibia:

Barbus hospes (Namaqua barb) - rare, endemic to the Orange River below the Augrabies Falls
Nothobranchius species (striped killifish) - endangered, endemic to Eastern Caprivi - known only from two small rainwater pans both of which are subject to interference from human activities.
Clarias cavernicola (cave catfish) - endangered, known from only one underground lake within a cave.
Tilapia guinasana (Otjokoto tilapia) - endangered, known from two sinkhole locales only, both of which are subject to human interference and exploitation.
Clarias platyprosopos (broadheaded catfish) - rare, known only from a few locales where rapids occur in the Zambezi and Kavango Rivers.
Austroglanis scateri (rock-catfish) - rare to intermediate, endemic to the Orange-Vaal system.

DISCUSSION

A generally accepted definition of a wetland is that of Cowardin et al. (1979): "various classes of water less than 3 m deep, often with floating, submerged or emergent aquatic vegetation". These authors defined three major wetland types:
1. river-associated wetlands,
2. endorheic wetlands, and
3. marine wetlands (eg. Cunene River mouth, Sandwich Harbour and the Orange River mouth; these will not be discussed in this paper as little is known about the freshwater fish populations of these wetlands (see Bethune & Roberts, this volume).

According to Bruton & Jackson (1983) floodplains are extensively used by larval, juvenile and adult fishes which perform an important role by converting plant and animal matter, often of allochthonous origin, into food for higher trophic levels.

The dynamics of a wetland fish community are largely determined by the changes in water level which alternately flood and drain the surrounding biome (Bruton & Jackson 1983). According to these authors, the duration and timing of flooding determines to a large extent the recruitment, growth and survival rates of the wetland fish stock. Besides stimulating breeding and providing shelter for the young, increased water levels result in a nutrient pulse into the aquatic system.

In the Kavango floodplains for example, extensive tracts of terrestrial vegetation are submerged and leaves, fruits and seeds are carried into the water. A rich invertebrate fauna develops which provides food for young fishes. The key to the productivity of many wetlands may be that they act as detritus traps, thus providing an abundant and constant supply of food for invertebrates and benthic-feeding fishes.

Inland fisheries

Inland fisheries are an important renewable resource in Africa and are particularly well-developed in wetlands. Therefore, the traditional rights of rural people who have no other source of income or animal protein need to be protected. Water level fluctuations are a major ecological force, and developers should resist the temptation to level out these fluctuations, either through the construction of dam walls or weirs which inhibit water flow, or of channels which increase water flow (Bruton & Jackson 1983). The main ecological role of wetland fishes may be to convert the resources at the base of the food chain, i.e. plants, detritus or epiphytes, into food for higher trophic levels.

Conservation status

Water abstraction, road construction which may cut off floodplain areas from the mainstream, river regulation (Cunene) and overgrazing of floodplain vegetation (Kavango and East Caprivi) all threaten the floodplain habitats of wetland fishes in Namibia. In the Cunene River the hydro-electric power station at the Ruacana Falls causes the waterlevel of the river to fluctuate by approximately 1 m when the turbines are in operation. Fish nests are then exposed to the atmosphere causing the die-off of fish eggs. Holtzhausen & van Zyl (1987) found no recruitment of *Oreochromis andersonii*, *O. macrochir* and *T. rendalli* in the Cunene River. They concluded that these fluctuations in water level are responsible for breeding failure of these species.

The major threat to the *Nothobranchius* species is gross habitat destruction from road building activities: both pans in which they occur in the Caprivi are adjacent to gravel roads which are constantly being resurfaced. Collecting for the aquarium trade also poses a potential threat to wild populations (Skelton 1987).

Aliens

The alien species *Cyprinus carpio* (carp), *Micropterus salmoides* (bass) and *Oreochromis mossambicus* (blue bream) are widely distributed in the catchment area of the critical Omuramba Omatako System (Schrader 1985) and thus pose a threat of invasion of the Kavango system. Baseline fish surveys in the Kavango River have been carried out by Bethune & Skelton (1984). Their results show that under certain circumstances, the alien *O. mossambicus* presently occurring in the Omatako Dam could enter the Kavango system causing genetic pollution of the indigenous *Oreochromis* species especially *O. andersoni*. The other two aliens may compete with the indigenous species for food and breeding grounds (Skelton & Merron 1984).

CONSERVATION PRIORITIES AND FUTURE ACTION

Some conservation priorities and future action to be taken proposed by various authors, are:

1. The distribution, biology and ecology of *Barbus hospes*, especially with respect to the changed enviromental conditions of the lower Orange River, should be investigated (Skelton 1987).
2. The proposals for the sanctuary status and protection of the habitat of the *Nothobranchius* sp. should be reconsidered by the authorities. Specimens should be collected and supplied to expert aquarists for the establishment of a captive breeding stock. The possibility of the translocation of this species to other suitable locales which are less exposed or subject to interference, should be investigated (Skelton 1987).
3. Some form of control is neccessary to prevent fish entrainment at the draw-off points of artificial water carriers (eg. the ENWC) and it was recommended that a grid-screen with a screenmesh size of 1 -5 mm diameter be installed over the draw-of point at Rundu (Skelton & Merron 1984; Bethune &

Skelton 1984).

4. No importation of alien fish should be permitted into the country, especially into the northern territories.
5. The effect that water level fluctuations caused by the hydroelectric power station at Ruacana in the Cunene River, has on the ecology of the fish fauna, should be investigated and if possible the water level should be stabilised during the breeding season from October to March-April (Holtzhausen & van Zyl 1987). This would ensure recruiting success and the survival of the fish fauna of the system.

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