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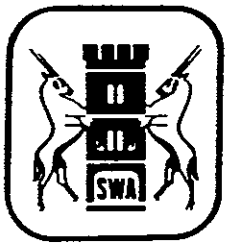

Invasive alien organisms in South West Africa/Namibia

Edited by C J Brown, I A W Macdonald and S E Brown

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CHAPTER 9 INVASIVE ALIEN FISHES IN SOUTH WEST AFRICA/NAMIBIA

H J Schrader

INTRODUCTION

This chapter has been based on information drawn from a variety of sources. For the white farming areas of SWA/Namibia data were obtained from questionnaires and from surveys conducted on a seasonal basis in state dams. In addition information was drawn from surveys conducted in the northern communal areas by various researchers (eg Barnard 1948; Schrader 1983; Merron et al 1984; Skelton and Merron 1984; van der Waal and Skelton 1984), but as no mention was made of alien species in any of these publications, discussion focusses mainly on the situation in the white farming areas.

IMPORTANT RIVER SYSTEMS IN SOUTH WEST AFRICA/NAMIBIA

The Cunene, Okavango and Orange are the only permanent rivers in SWA/Namibia, excluding those in the eastern Caprivi. The Cunene forms the natural boundary between north-western SWA/Namibia and Angola, and flows into the Atlantic ocean. In the north-east the Okavango River forms the boundary between the same two countries, before flowing into Botswana, where it ends in the Okavango Swamps. The Orange River forms the boundary between southern SWA/Namibia and South Africa.

The Omatako drainage system from the central to the north-eastern parts of the country flows into the Okavango River. A considerable amount of discussion focuses around this system as the possibility exists that invasive fish species, already occurring in farm dams in the vicinity of this system, could spread into the Okavango River. The Cuvelai system drains from southern Angola through Owambo and into the Etosha Pan. Since the mid-1970's, however, this has been artificially linked to the Cunene by means of the Ombalanta canal. This therefore presents a potential means of pollution of the Cunene with alien species.

Most of the rivers which flow towards the west run through the Namib desert and during a good rainy season flow into the Atlantic ocean. Invasive alien species do not pose any ecological threat in these seasonal rivers. Other seasonal rivers of note are the Olifants and Nossob drainage sytems in the south-eastern parts of the country, which end in thick Kalahari sand (which limits further distribution of any alien species), and the Fish River which drains the central and southern parts of the country and flows

into the Orange River. The threat of invasion of alien species into any of these seasonal rivers is minimal.

The following species of fish can be considered as invasive aliens in SWA/Namibia: Cyprinus carpio, Micropterus salmoides and Oreochromis mossambicus.

SPECIES ACCOUNTS

Cyprinus carpio (Map 19). It is thought that this species was probably introduced to this country by early German settlers. It was supplied to farmers by the Freshwater Fish Institute at Hardap Dam between 1974 and 1983. Since 1983 it has neither been supplied to farmers within SWA/Namibia, nor have any permits been issued for its importation from elsewhere. It is, however, already widely distributed throughout the farming areas and state impoundments, and its potential rate of spread is believed to be very high as farmers show a preference for this species. This preference is probably at least partly due to ignorance of other options, a situation which is rapidly changing since the establishment of the hatchery at Hardap, and the subsequent availability of fingerlings of indigenous fish.

This species is already widely distributed in the catchment area of the critical Omuramba Omatako drainage system, and thus poses a threat of invasion of the Okavango system. No threat of genetic pollution by this species exists, but it would compete with indigenous species for food and breeding grounds, and because of its feeding habits it stirs up mud which increases the turbidity of the water which can have a detrimental effect on predatory species.

No feasible method for the removal of this species from the sensitive catchment areas has as yet been suggested. Its distribution is so extensive as to render such efforts as have been proposed overwhelmingly costly and time consuming.

Micropterus salmoides (Map 20). This species was imported from the Jonkershoek hatchery to municipal pools in Narubis in 1932, and to Windhoek in 1934. Further introductions occurred between 1944 and 1949 (Harrison 1936; Inland Fisheries Departmental Reports 1944-1949). As with the previous species it was supplied by the Freshwater Fish Institute at Hardap between 1974 and 1983. Since 1983 it has not been supplied to farmers within SWA/Namibia, and no permits have been issued for its importation. It is already, however, widely distributed throughout the country, including within the sensitive catchment area of the Omatako system, and therefore poses a threat of invasion to the northern water systems. The high turbidity of seasonal rivers, however, does appear to have an effect on the distribution of this species, and in addition it has very specialized breeding requirements, needing a gravel substrate on which to spawn. It can therefore be regarded as less of a potential hazard than the other two species. No threat of genetic pollution exists. If it were to become established it would compete with indigenous species for food, and possibly also for spawning grounds if it were successful at utilizing shallow sandy beds as a spawning substrate. This, however, seems unlikely.

No feasible method of eliminating M salmoides from this country can be envisaged at present. Its spread within the country can be controlled to some degree by the fact that it is no longer available from the Hardap Dam hatchery, and no permits are issued for its import under any circumstances.

Oreochromis mossambicus (Map 21). This species was introduced to SWA/Namibia from Jonkershoek in the Cape in 1947 and 1949. From 1974 until 1983 this species was supplied to farmers by the Freshwater Fish Institute at Hardap Dam. Since 1983 tnis supply has been limited to farms south of Windhoek, but it is now considered to be fairly widely distributed throughout the country. It already occurs in the critical Omatako Omuramba catchment and there is a possibility that it could have spread to Owambo. It should therefore be regarded as a potential threat to the Okavango, Cuvelai and Cunene systems. The potential rate of spread is difficult to assess as it is dependent on a wide variety of factors, including human activity, annual rainfall, periodic droughts and the general hydrology of the systems involved.

O mossambicus is mainly popular with farmers due to its capacity for keeping dams and reservoirs clear of algae. It is not farmed commercially in this country, and few farmers make use of this species either as rations for their labourers or for sporting and recreational purposes.

The impact of an invasion of the northern river ecosystems by this species would be considerable as there is a strong possibility that genetic pollution of indigenous species would occur. The potential for interbreeding between O mossambicus and the indigenous O machrochir and O andersonii would appear to be great. In addition O mossambicus would probably compete aggressively with indigenous cichlids for spawning grounds as well as for food.

The only presently envisaged means of controlling the spread of this species is by killing off all the O mossambicus in the Omatako catchment area with the fish poison, rotenone. The disadvantages of such a method are fairly extensive. All fish in the dams would be affected, and the cooperation of farmers would have to be attained. Farmers would have to be persuaded to accept losing all their fish stocks on condition that the fish were replaced by indigenous species which could be supplied by the Freshwater Fish Institute at Hardap Dam. In addition the costs of the chemicals and the extent of the manpower which would be necessary for this project to be successfully undertaken render it rather a daunting proposition.

Further distribution of this species to farm dams and other water bodies is under the control of the Department of Agriculture and Nature Conservation. Since 1983 this has been restricted to areas south of Windhoek, while indigenous species such as O macrochir, O andersonii and Tilapia rendalli rendalli, which are bred in the hatchery at Hardap Dam, are available for distribution to the northern parts of the country.

POTENTIAL TRANSLOCATION OF INDIGENOUS SPECIES VIA ARTIFICIAL DRAINAGE LINKS

In addition to the potential invasion of alien species into SWA/Namibia water systems, there is also a problem in this country of translocation of

indigenous fish species from one system to another by means of artificial drainage links. This may result either in species which were previously absent entering a water system or in the genetic mixing of strains of the species which have been genetically isolated for a very long time and might prove to be taxonomically distinct. The Cuvelai and Cunene systems have been linked artificially by the Ombalanta Canal since the mid-1970's. Fish species indigenous to the Cuvelai system which could spread to the Cunene, and species indigenous to the Cunene that could spread to the Cuvelai system, are listed in Table 9.1.

As part of a National Master Water Plan, the Department of Water Affairs is constructing a long-distance water carrier known as the Eastern National Water Carrier (ENWC). This is to be an integrated water supply project which will eventually supply water from such sources as the Okavango River, the Karstveld boreholes and other surface sources via a series of pipelines, open canals, inverted syphons and storage impoundments to meet the water demands in the interior of SWA/Namibia. This system is not yet linked with the Okavango River, but this should be the case by the 1990's. Species which have the potential of invasion via the ENWC are listed in Table 9.2.

TRANSLOCATED INDIGENOUS SPECIES

Although not confirmed, it is believed that the sharptooth catfish, Clarias gariepinus, and the banded tilapia Tilapia sparrmanii, in farm dams in the northern area impoundments could be of the southern (Orange River) strain, and could pose a threat of genetic pollution to the northern or Okavango River strains of these species.

RECOMMENDATIONS

(1) Some form of control is necessary to prevent fish entrainment at the draw-off points of artificial water carriers. It is recommended that research should be undertaken to investigate feasible methods of control. The existing canal between the Cunene and Ombalanta could be used as a case study example.

(2) No tropical fish popular in the aquarium trade should be imported into the northern areas.

(3) Export of live fish from SWA/Namibia to other countries should only be permitted in cases where valid import permits have been obtained. Exportation of fish should be under the control of the nature conservation body of the country of import.

(4) If a case should arise where an aquatic problem would appear to require biological control, this should not even be considered until a careful investigation of both the problem itself and the effects on the ecosystem of the proposed control species has been undertaken.

TABLE 9.1. Fish species indigenous to the Cuvelai system which could spread to the Cunene River (column A), and fish species indigenous to the Cunene River which could spread to the Cuvelai system (column B) via the artificial Ombalanta Canal. Some species occur in both systems but the two strains are thought to have been genetically isolated for a great many years.

SPECIES	A	B
Alestes lateralis	*	
Aplocheilichthys johnstonii		*
Barbus afrovernay		*
B barnardi	*	
B bifrenatus	*	
B codringtoni		*
B eutaenia		*
B fasciolatus		*
B lineomaculatus		*
B mattozi	*	
B paludinosus	*	
B puellus		*
B radiatus	*	
B tangandensis	*	
B cf trimaculatus	*	
B unitaeniatus		*
Clarias gariepinus	*	
C ngamensis	*	
C stappersi		*
C theodorae		*
Coptostomabarbus witlei	*	
Haplochromis cf mellandi	*	
H cf steindachneri	*	
Haplochromis sp		*
Hemigrammocharax machadoi	*	
Hippopotamyrus ansorgi	*	
Labeo cylindricus	*	
L molybdinus	*	*
Mormyrus lacerda		*
Neobola brevianalis	*	
Oreochromis andersonii	*	
O macrochir		*
O mossambicus (exotic)	*	
Orthochromis machadoi		*
Pharyngochromis cf darlingi	*	
Pollimyrus castelnaui		*
Pseudocrenilabrus philander	*	
Rhabdalestes maunensis	*	
Schilbe mystus	*	
Serranochromis (Sargochromis) angusticeps		*
S (Sargochromis) codringtonii	*	*
S (Sargochromis) giardi	*	*
S (Serranochromis) macrocephalus	*	
S robusta jallae		*
Serranochromis sp		*
Synodontis macrostigma	*	
S leopardinus	*	
S woosnami	*	
Synodontis sp		*
Tilapia rendalli	*	*
T sparrmanii	*	*

TABLE 9.2. Potential invaders of the Okavango system via the Eastern National Water Carrier.

SPECIES
Alestes lateralis
Amphilius uranoscopus
Aplocheilichthys johnstonii
Barbus barnadi
B barotseensis
B bifrenatus
B palludinosus
B poechii
B radiatus
B unitaeniatus
Chiloglanis fasciatus
Clarias gariepinus
C ngamensis
Labeo cylindricus
L lunatus
Mastacembelus frenatus
M van derwaali
Oreochromis andersonii
Pharyngochromis darlingi
Pollimyrus castelnaui
Pseudocrenilabrus philander
Schilbe mystus
Synodontis leopardinus
S microstigma
Tilapia rendalli
T sparrmanii