THE COLONIZATION OF CABORA BASSA, MOZAMBIQUE, A NEW MAN-MADE LAKE, BY FLOATING AQUATIC MACROPHYTES

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Abstract

* Eichhornia crassipes and Salvinia molesta, both notorious weeds, are present in the catchment of Cabora Bassa, a new man-made lake on the Zambezi River, Mozambique.

Weed dispersal, controlled by wind and current (and indirectly by rate of lake filling and lake morphology) culminated in the distribution of mats in the eastern and western extremities with very small cover in central lake areas. Eichhornia offset production was initially very rapid later diminishing markedly with many plants showing symptoms of nutrient deficiency. Eichhornia completely dominated mat composition at the end of the year whilst Salvinia cover was negligible.

Heavy drawdown in the middle of the year lead to destruction of nearly 50% of the weed mats. Whilst pre-drawdown levels were attained by the end of the year, there was no evidence for expected explosive population growth and extensive weed colonization in the filling phase.

Introduction

Cabora Bassa, a new man-made lake on the Zambezi River, Mozambique, began to fill on 5 December 1974.

Floating aquatic macrophytes are infamous for explosive population growth an example of which is Salvinia molesta, D. S. Mitchell, at Lake Kariba, also on the Zambezi River. This plant, a fern, showed spectacular growth in the lake's formative years covering 1000 km² in the fourth year after closure (Mitchell, 1970, 1973). The water hyacinth, Eichhornia crassipes, (Mart.) Solms, is a widespread pest of waterways in the warmer parts of the world and has been a serious problem in several African impoundments including the Jebel Aulia Dam, north Africa (Little, 1966), Lake McIlwaine on the Hunyani River, a tributary to the Zambezi (Davies et al., 1975) and Hartbeespoort Dam, South Africa.

The water hyacinth, Salvinia molesta, Pistia stratiotes L. and Azolla nilotica Decne ex Mett. were recorded in the catchment of Cabora Bassa during pre-impoundment surveys (Macedo, 1974, Davis, Hall & Jackson, 1975) and were considered potential pests. Salvinia and Pistia are present throughout the Zambezi system while Eichhornia is present in both the Kafue River of Zambia and the Hunyani (= Panhame) River of Rhodesia, both of which are tributaries to the Zambezi above the new dam.

Pre-impoundment assessments of the problem of aquatic weed infestation, based largely on experience at Kariba, predicted extensive and rapid colonization at Cabora Bassa. Davies et al. estimated a probable macrophyte cover of 25-40% of the lake surface within two years of closure followed by a gradual decrease as nutrient levels stabilized. They predicted that Eichhornia would be the major pest and would dominate Salvinia.

Extensive weed cover could interfere with hydroelectric installations and water transport, seriously affecting fishing, navigation and recreation (Little, 1966;
Mitchell, 1974) with the additional danger of rapid spread of disease vectors on floating weed mats (Mitchell, 1974; Jackson & Davies, 1976). Use of weed for soil improvement or livestock feed (Davies et al., 1975; Oliviera, 1972) at Cabora Bassa is not, at the moment, a feasible proposition because of prohibitive harvesting and transport costs and the distance of agricultural settlements from the lake.

Due to the possible disadvantages of these aquatic plants and the likelihood of their explosive development, a joint research and control project was started in the initial filling phase of the lake.

The perennial input of floating macrophytes and the unlikelihood of complete control in the source countries, limits the possibility of overall weed control at Cabora Bassa. Instead strategic weed control, which included the use of floating barriers, herbicides, manual harvesting and biological agents was employed but is not further described here.

A study of invasion of the lake by floating macrophytes was made and this paper records observations on aspects of immigration and colonization in 1975, the first year of the lake. Comparisons of weed ecology at Cabora Bassa and Kariba, both on the same river system and in a similar climate, may provide general insight into floating macrophyte biology in the large African impoundments.

**Morphology and Limnology**

Cabora Bassa, situated on the Middle Zambezi River, is smaller than lake Kariba which is some 500 kms upstream (Table 1). The lake has five basins, the Mucangadze, Carinde, western and eastern Mucanha, Chicoa and Gorge Basins, from west to east respectively (Davies, Hall & Valente, 1976; Bond et al., 1977). (Fig. 1). The western basins are shallow and, in the lake's first year, showed riverine characteristics. The deeper eastern basins rapidly developed lentic features (Bond et al., 1977). At lake levels prevailing in 1975, basins were separated by marked constrictions caused by islands or promontaries. There is a marked difference in slope of northern and southern shores, the former, particularly in the Chicoa and Mucanha Basins, being generally steeply sloping whereas southern shores have a very gentle gradient. Since virtually no trees were cleared from the lake perimeter, the southern shores were choked with a broad band of semi-submerged terrestrial vegetation up to

Fig. 1. Lake Cabora Bassa, Mozambique, at mean retention level of 326 m AMSL. Basins are numbered from east to west respectively: 1 - Gorge, 2 - Chicoa, 3a - Mucanha East, 3b - Mucanha West, 4 - Carinde, 5 - Mucangadze. Chicoa and Mucanha Basins are occasionally referred to collectively as the central basins.