Composition of the Invasive Macrophyte Community in three river basins in the Okyeman Area, Southern Ghana

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Abstract

A survey was carried out to study the composition of the invasive aquatic macrophyte community including submerged forms, in three river basins the Okyeman area namely the Ayensu, Birim and Densu basins. Of prime interest was the presence of any one of these four species, *Pistia stratiotes* (water lettuce), *Eichhornia crassipes* (water hyacinth), *Azolla* species (fairy fern) and *Salvinia molesta* (Kariba weed), a floating water fern, which are alien to Africa. The number of invasive macrophytes encountered in the survey of the macrophytes was low with *Eichhornia crassipes* (water hyacinth) conspicuously missing. A concerted effort to exclude these species from our freshwater bodies is suggested as the presence of any of these four is regarded as detrimental to aquatic life, because once they become established they tend to prevent the growth of native ones.

Introduction

Naturally, any freshwater body creates conditions that support some sort of flora (Westlake, 1981). Aquatic flora, including macrophytes, are important to any freshwater ecosystem. This is because they are primary producers (Cooper & Knight, 1985), a property they share with other plant groups like the planktonic and the periphytonic algae. They may also provide food for other organisms like birds (Batzer *et al.,* 1993) and fish (Crowder & Cooper, 1982), as well as play other important roles in ecological processes such as decomposition and energy transfer (McQueen *et.al.,* 1986; Dvorak, 1996). Alternately, heavy plant growths may clog rivers, cause local flooding, reduce available fish habitat and impede canoe navigation and recreation (Boyd, 1971).

Almost all the macrophytes in our freshwater bodies are introduced or invasive species from South America. These alien species are the sources of major problems associated with freshwater ecosystems, as their proliferation rates are so high for obvious reasons. They out compete the native biota and thus reduce the levels of local biodiversity. Once established they tend to prevent the growth of the others or are completely replaced by one of them. This tendency operates mainly due to the absence of native enemies for the invasive species. Four particular invasive floating plant species, native to South America, are widely important in the tropics and are easily recognised. These are *Pistia stratiotes* (water lettuce), *Eichhornia crassipes* (water hyacinth)), *Azolla* species (fairy fern) and *Salvinia molesta* (Kariba weed), a floating water fern. They tend to grow vigorously under conditions of reduced water flow rates created through water diversion or damming, or where nutrient levels have been boosted by agriculture or settlement.

In the study of macrophytes in relation to their growth and role or effects on the water body in which they are found, it is customary to determine their composition and abundance (Payne, 1986; Westlake, 1981). The abundance is then estimated in terms of biomass/ standing crop or fresh weight.

This paper reports the findings of a survey carried out in three river basins in the Okyeman area in Southern Ghana, on the composition and abundance of invasive species. The work was carried out as part of an ecological survey carried out to generate information on the freshwater ecosystem to help develop a tool kit to manage the freshwater system using the ecosystem approach.

Methodology

Study area

Details of the study area including the sampling sites are provided elsewhere in another write up (Table 1).

Sampling

A survey of the aquatic macrophyte vegetation was carried out during the period. Sampling was done by visits to the sampling sites and locating quadrats at random, following the methods of Hopkins (1974) and Dennis (1984). Notes were then taken in writing and photographs.

Plant identification

All plants were identified on site and confirmed at the Ghana Herbarium, Department of Botany, University of Ghana, Legon.

Results and discussion

Table 1 indicates the list of invasive aquatic plants identified during the survey, as well as their densities at the various sampling sites. The composition of the macrophyte vegetation is low, as well as the densities, therefore the invasive plant species encountered in the survey could be described as marginally present. More common aquatic macrophytes, most of which are also alien to Africa including *Vossia* sp., *Echinochloa* sp., *Typha domingensis*, *Ludwigia* sp., *Neptunia* sp., *Ipomoea* sp., *Polygonum* sp., *Leptochloa* sp. were however not encountered during the survey.

A very significant finding was the absence of *Eichhornia crassipes* (water hyancinth) and *Ceratophyllum demersum* (Hornwort). Water hyacinth has been described variously, including a description as an obnoxious weed with a very high proliferation rate, and its presence in any water body indicates doom. *Ceratophyllum demersum* is known to provide suitable habitats for the snail host of the parasite responsible for the incidence of bilharzia. However, the need to confirm its absence by the prevalence of bilharzia from medical records should be undertaken.

The densities of all the plants are low with site B_3 in the Birim basin recording a very high number apparently due to trapping of plants in stagnant conditions created at the site. The densities recorded in the survey did not indicate any alarming levels, however, their presence should provide the platform for regular and effective monitoring systems, to ensure their total absence.

The levels of infestation and the percentage cover of these species in other catchments like the Lower Volta basin are high. Parts of the Volta basin, particularly the lower stretches, are infested with aquatic weeds. Notable plant types involved in this situation include *Echinochloa* sp. *Leptochloa* sp. and *Vossia* sp. (emergents) as well as *Typha domingensis*. In fact, *Typha domingensis* has virtually taken over certain areas with about 90% cover. The most dominant and widely distributed submerged

TABLE 1
Number of species of introduced plants counted at respective sites in indicated river basins.

Ayensu River

	Sampling Site Number of plants counted (per m²)				
	Azolla	*Lemna*	*Pistia*	*Salvinia*	*E. crassipes*
A_1	12	3	3	2	-
A_2	8	-	3	2	-
A_3	-	4	2	1	-
A_4	6	11	-	-	-

Birim River

	Sampling Site number of plants counted (per m²)				
	Azolla	*Lemna*	*Pistia*	*Salvinia*	*E. crassipes*
B_1	12	6	2	2	-
B_2	10	7	2	3	-
B_3	nc*	5	3	1	-
B_4	4	6	1	2	-
B_5	14	12	1	1	-
B_6	3	3	1	3	-
B_7	6	12	2	1	-

nc* *Very high numbers*

Densu River

	Sampling Site number of plants counted (per m²)				
	Azolla	*Lemna*	*Pistia*	*Salvinia*	*E. crassipes*
D_2	5	11	3	3	-
D_3	12	12	2	6	-
D_3	11	5	4	4	-
D_4	6	4	5	5	

plants were *Ceratophylum demersum*, with up to 90 % cover along the entire stretch of the Lower Volta River, followed by *Vallisneria aethiopicum,* about 10–15%. Interestingly, *Eichhornia crassipes* (water hyacinth) has also not been reported in the lower Volta Basin. The lower Volta Basin also has these four plants identified in this survey also occurring in marginal quantities, thus, contributing marginally to the aquatic plant menace in the area. Another river basin in Ghana with an aquatic weed problem is the Tano basin in the Western part of the country. This area has the highest level of *Eichhornia crassipes* (water hyacinth) in the country.

It has been reported by Mitchell (1976) that interference with the natural flow of a

river system, damming and settlements, has the capability of introducing new species or explosive growth of existing species. With the current changes in the land use system, including farming systems and settlements, the need to monitor the presence of these plant species is very important. The common type of farming in the study area is shifting cultivation and this has the potential of changing the natural vegetation, as well as affecting the hydrology and sheltering of the major river systems in the area.

Regular and effective monitoring systems should be instituted, as well as easy identification kits for inhabitants especially school children, to educate and create awareness for effective monitoring and management.

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