Macrophytes in Niger Delta Inland Waters

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Abstarct— *Aquatic macrophytes functions in several ways in water bodies, they are critical to Niger Delta inland waters because they enhance the physical structure of the habitat which serves as living space for small aquatic animals and play a vital role in fisheries production. Macrophytes play an important role in the aquatic environment but unfortunately very little attention is being directed towards the conservation of these aquatic resources and they can get out of control and create problems when they are not properly managed. This paper examines common aquatic macrophytes in Niger Delta in Nigeria with emphasis on benefits, problems and also proffers best practices for adequately managing the macrrophytes in Niger Delta inland waters.*

Keywords— Macrophyte, Niger Delta Waters, aquatic environment Fish production.

I. INTRODUCTION

The Niger-Delta Region is one of the most important deltas in Nigeria. The region naturally is rich in crude oil, gas, water, wildlife; useful vegetation's and human resources. It is ranked as the world's 6th largest crude oil producer and exporter. It covers relatively over number ecological zones such as the sandy coastal ridge barriers, brackish mangrove, fresh water permanent, seasonal swamp forests, and the lowland rainforests (Udo, 1987). The Region of the Niger Delta covers over 20,000km2 within natural wetlands of 70,000km2.The physically formed flood plains makes up 7.5% of Nigeria's total landmass of 923,800km2. In addition to supporting abundant species of animals and plants, which sustains a wide variety of consumable food and micro-organisms, more species of fresh water fish, crayfish, crabs and reptiles than any other ecosystem in West Africa, this incredibly well-endowed ecosystem contains one of the highest concentrations of biodiversity in the world (Udo, 1987; Akinbode, 2005; Baird, 2010; Vidal, 2010).

The term "aquatic macrophyte" refers to large plants visible to the naked eye and having at least their vegetative parts growing in permanently or periodically in aquatic habitats or environment (saltwater or fresh water). Macrophytes are commonly observed in aquatic environment throughout the world (Reddy 1984).They are important components of freshwater ecosystem because they enhance the physical structure of habitats and biological complexity which increase biodiversity within littoral zones (Esteves 1998, Wetzel 2001, Pelicice et al 2008). Macrophytes are critical to our aquatic environment and many people misunderstand the importance.

The freshwater ecosystem in Nigeria serves as an important refuge for numerous animals and vascular plants which have sustained the communities around them. But in recent time both natural and human induced environmental problems had either destroyed or altered the associated ecosystem with consequence impact on the endowed natural resources. And yet little is paucity known about Nigerian water bodies associated Flora and Fauna including inventories, socio economic values and overall management Macrophytes play a vital role in the aquatic environment and the lives of rural communities but unfortunately very little effort is being directed towards the conservation of these resources (Daddy et al 1993).

The objective of this paper examines the roles of macrophytes on the fish production and aquatic environment in Niger Delta and subsequently recommending remedial actions to curtail the nuisance it may cause.

II. POSITIVE EFFECTS OF MACROPHYTES

Macrophytes in water bodies has great value especially inlands waters, streams, rivers, lagoons and in shallow areas of lakes and their presence has been found to be beneficial to fisheries. Macrophytes are not only beneficial to the biological community but they are also critical to the physical and chemical process that occurs in the aquatic ecosystem. There are useful varieties of benefits which macrophytes play in an aquatic environment.

Macrophytes in the aquatic environment plays an important role in fisheries production and are basically less valued as part of any water body, however locally some cultured species of fish are dependent on macrophytes as source of food, herbivorous fishes like *Tilapia zilli*.Aquatic plants such

as *Lemna pausicostata* is eaten by fish (Mbagwu and Adeniji, 1998).Also periphytic algae growing on the surface of aquatic plants are fed upon by fish species (Ayeni et al 1999). Members of the Tilapia genus *Oreochromis* eat coarser food including macrophytes, *oreochromis niloticus* feeds on phytoplankton and aquatic vegetation. (Ezeri et al 2003).

According to Meade (1992) aquatic macrophytes exhibits a feeding relationship among fishes while Agbogidi et al (2000) reported that the fingerlings of carnivorous fishes feed on aquatic macrophytes until the guts are fully matured enough to take animal. The adult carnivorous fishes also feed on invertebrates which are linked with macrophytes directly. Macrophytes provide spawning ground and shelter for a large variety of economically important fish species.(Araujo-Lima et al 1986).It was reported by (Agbogidi et al 2000)that the finely dissected leaves of some macrophytes such as *ceratophyllum dermersum* and *Myriophyllum spicatum* provides shelter, Spawning substrates and nursery sites for many fishes. Young fish use aquatic macrophytes as source of cover from predatory fish thus making macrophytes as important nurseries for Juveniles.

The roots of *Pistia stratioties* and *Salvinna nymphellyla* provides habitat as well as a hiding place for fishes and invertebrates against predation by birds and other fishes (Beebee, 1992:ICAAE, 1992).Macrophytes also provide refuge for animals and protect them against the current as well as from predators.

Macrophyte helps prevent soil erosion by protecting the shoreline from waves, currents and actions of the wind around lakes and ponds. This increase water clarity and reduced the amount of pollution entering the environment. Boyd (1970) reported that this has been used in bio manipulation of fish ponds to enhance fish production. Large amount of nutrients are taken up by aquatic macrophytes which is an effective means of removing nutrients from effluent or natural waters (Uka et al 2009a).The findings of Brix and Schierup (1989) showed that attention is now geared towards the ability of aquatic macrophyte to control pollution and also treat municipal and industrial wastewater. This Therefore reveals that macrophytes can be efficient indicators of water quality and their presence may enhance water quality due to their ability to absorb excessive load of nutrient (Petre 1990). *Eichhornia Crassipes* has been used successfully in wastewater treatment system to improve water quality by reducing the levels of organic and inorganic nutrient according to Brix (1993).

In aquatic environment, some aquatic macrophytes plays vital part of the chemical cycling in aquatic environment They serve as corner stones of an aquatic environment and have the physiological ability of removing mineral nutrients and heavy metals and other contaminants can be removed by microorganisms (Uka et al 2009a).It has been demonstrated that aquatic macrophytes such as *Eichornia crassipes, Lemna spp. Salvinia spp, Typha spp* and *Azolla spp*. has been utilized as a means of reducing nutrients levels of polluted water (Oki and Une, 1989).

Table.1: Classifications of macrophytes species in Niger Delta Waters

Family	Specie	Common name
Cyperaceae	*Cyperus difformis*	Small flower umbrella
	Rhynchospora corymbosa	Matamat
	Cyperus iria	Rice flat sedge
Nymphaeceae	*Nymphea lotus*	Water lily
Poaceae	*Sacciolepsis africana*	Wild rice
Commelinaceae	*Aneilema beniniense*	Aneilema
Lamiaceae	*Platostoma africanum*	Asirisiri
Asteraceae	*Aspillia africana*	Wild sunflower
Tiliaceae	*Triumfetta cordifolia*	Burweed
Pontederiaceae	*Eichhornia crassipes*	Water hyacinth
Onagraceae	*Ludwigia decurrens*	Water primrose
Athyriaceae	*Diplazium sammatti*	

Source: (Dienye, 2015)

NEGATIVE EFFECTS OF MACROPHYTES

Large populations of macrophytes develop only when the environment is altered either physically or through the introduction of pollutants. The Non –native species may also develop large uncontrollable population when intentionally or mistakenly introduced into areas where they have no natural enemies like some herbivorous fish to check their growth. Most problems with macrophytes arise when growth becomes too dense. The floating mat of vegetation of macrophytes in the aquatic environment covers available sunlight from the water surface, which results in low production of natural fish food (Phytoplankton and Zooplankton species) thus resulting in overall low fish productivity. These invasive aquatic macrophytes affect biodiversity as well as water quality (Uka et al 2011).

Submerged species can also spoil the gravel spawning beds of some fish (Salmonids) and high densities of photosynthesizing macrophytes are capable of causing large fluctuations in oxygen; this can stress many fish species. Similarly, fish mortality may occur when photosynthesis does not exceed respiration thereby resulting in oxygen depletion. Emergent plants and submerged macrophytes can prevent access and also hinder navigation in water crafts transportation route and maybe detrimental to hydroelectric facilities (Mandal 2007).It also affects netting of fish in the aquatic environment. Macrophytes wind around the propellers of boats and stop them. Mats of macrophytes like water hyacinth can even stop a ship. While some aquatic macrophytes deter certain disease carrying organisms, others provide an ideal shelter. Several human diseases are transmitted through intermediate host that are either dependent upon certain macrophytes for completion of their life cycle or habitat stagnant water resulting from the obstruction of water courses by vegetation. High infestation of *Pistia stratiotes* and *Ceratophyllum demersum* harbor snails that transmit Schistomiasis (African sleeping sickness). The intermediate host is an aquatic snail that lives among aquatic vegetation. Macrophyte growth can provide the quiet water environment that is ideal for mosquito larvae development (Bromilow 2010).

SOME COMMON MACROPHYTES IN NIGER DELTA WATERS

Family name: Cyperaceae `
Botanical name: *Cyperus difformis*
Common name: Small flower umbrella

Family name: Nymphaeceae
Botanical name: *Nymphea lotus*
Common name: Water lily

Family name: Poaceae
Botanical name: *Sacciolepsis africana*
Common name: Wild rice

Family name: Cyperaceae
Botanical name: *Rhynchospora Corymbosa*
Common name: Matamat

Family name: Commelinaceae
Botanical name: *Aneilema beniniense*
Common name: Aneilema

Family name: Pontederiaceae
Botanical name: *Eichhornia crassipes*
Common name: Water hyacinth

Family name: Lamiaceae
Botanical name: *Plastostoma africanum*
Common name: Asirisiri

Family name: Tiliaceae
Botanical name: *Triumfetta cordifolia*
Common name: Cordleaf burrbark

Family name: Asteraceae
Botanical name: *Aspillia Africana*
Common name: Wild Sunflower

Family name:Cyperacea
Botanical name:*Cyperus iria*
Common name: Rice flat sedge

III. MACROPHYTES MANAGEMENT METHODS

The management of macrophytes in Niger Delta waters is to achieve balance in the ecosystem by the control of excessive invasion of plant species.

There are many ways of controlling aquatic plants or macrophytes such method include:

1. Preventive Control: Most aquatic macrophytes are carried and introduced into the inland waters by wind, birds, fish, boat trailer, fishermen, or other means, but the Prevention of these macrophytes starts by total elimination or reducing the sources of spread. Aquarium plants should not be washed into aquatic environment where it could develop and grow.

2. Mechanical control: This method involves manually removing the macrophytes either by hand pulling or raking. Since most aquatic macrophytes are perennial in nature and they have underground portions that can resprout new shoots, therefore it is essential to harvest below ground growth for effective control. According to McComas (1993). For larger water body, motor-driven weed harvesters with underwater

cutting blades are available. The principle behind these harvesters is the same as mowing a lawn. The macrophytes will not be eliminated, but they can be prevented from growing to the surface and becoming a nuisance. When mechanically controlling aquatic macrophytes, harvest the cut vegetation and dump it where it cannot re-enter the water. The cut vegetation fragment, if left to float in the water body can reproduce new plants.

3. Biological control: Many exotic and native organisms have been used for biological control. This method involves using beneficial organisms to control the spread of macrophytes. Also people may consider the introduction of an animal or bacteria that feeds upon noxious plants. However this method could cause ecological destruction if the wrong type of biological agent is introduced (Gallagher and Haller 1990).

Some common biological treatments are:

I. Aquatic plants: The introducing of some desired species of macrophytes has the tendency of getting rid of the species which constitute nuisance in the aquatic environment. However, native macrophytes are usually good but because they have more checks and balances with the local environment. This method can be difficult because of the invasive species which can successfully out compete desirable macrophytes. This method works better when the invasive plants are removed.

II. Plant eating fish: The introduction of macrophytes eating fish or herbivores can assist in limiting macrophyte growth. Example Grass carp are being used to help control aquatic vegetation. They are bred to be sterile in order to inhibit reproduction in the pond and will eat vegetation in the pond. Chinese Grass carp (*Ctenophanyngodon idella*) will consume large quantities of aquatic macrophytes in the right conditions. Their rate of feeding increases with rising temperature. Below 16^{o}C their activities have very little effect, rising to a peak level at 25^{o}C (at this temperature they can consume their own weight in plants every day). Grass carp are selective feeders, preferring the soft plants *Elodea canadensis* to the more fibrous ones such as water lilies and emergent water plants. (Wells and Clayton 2005)

Common carp if introduced into an aquatic environment in the correct density will uproot the softer stemmed plants while feeding in the aquatic environment and quite high densities of carp are required to achieve control.

III. Bacteria: Macrophyte growth can be controlled with the use of bacteria and fungi. Certain varieties of bacteria and fungi live on various macrophytes and can be used to selectively control aquatic vegetation. When the bacteria and fungi is introduced the aquatic macrophyte will die from the and the more desirable plants will be unharmed.

4. Chemical Control: Herbicides control aquatic macrophytes vegetation without posing harm both to the fish and wildlife only when it is properly applied in some instance herbicides application can selectively control particular macrophyte species without killing others. It also can fit into an aquatic plant management plan when it is desirable use to treat some vegetative areas and leave other untreated. Herbicides that kill the parts of the plant with which they come into contact with are called contact herbicides. Others that do not kill the plant rapidly in this way but enter the plant itself are known as translocated herbicides. As a general rule, only the latter groups are of use in controlling re-growth of perennial macrophytes. They can further be divided into non selective which will kill all plant and selective which kill only certain species of aquatic macrophyte.

Herbicide treatment can be costly and may provide only short term relief from the real problem, usually fertile waters.it is important also to understand that when aquatic macrophytes are killed by chemicals they rot and release their contained nutrients (fertilizers) into the aquatic environment.These nutrients are then available to stimulate future macrophyte growth, often requiring more treatments. Some common chemical treatment methods are:

I. Diquat herbicide: The herbicide called Diquat is a liquid, contact herbicide that is very powerful and fast acting form of aquatic weed and algae control. It is usually sprayed on the aquatic vegetation the treated vegetation will quickly die and turn brown from this treatment. A common diquat herbicide brand is REWARD and is best used with greater result for floating aquatic vegetation and it is safe to use. Diquat herbicide should not be used when the water is muddy because soil particles will remove it from the water. (Getsinger1998, Netherland et al. 1997).

IV. CONCLUSION AND RECOMMENDATIONS

Despite the general belief that most aquatic macrophytes pose obnoxious threat to the ecosystem, they could still be used in various ways to make them environmentally friendly particularly if its utilization is integrated with mechanical control which favours consistent but sustainable aquatic macrophyte control by the riparian communities at low cost and for added economic benefits. It is recommended that the industrial activities in the Niger delta waters should be properly checked as it affects the macrophytes in relation to fish production, they serve as substrate ground, feeds and

habitat for aquatic animals and also enhance the physical structure of habitats and biological complexity which will in turn increase biodiversity within the water bodies It is the tendency of the aquatic macrophytes to a nuisance that has discouraged their study and utilization and encouraged the tendencies to eradicate them. However, it is by applying suitable management regime that the plants may be controlled and kept within safe limits and some even utilized at a sustainable level.

The success of the utilization of aquatic macrophytes at a sustainable level can only be achieved if the habitat of these macrophytes are properly managed, this demand habitat conservation. Any conservation efforts in Niger Delta and Nigeria should solicit local support through awareness. There is need for careful assessment of nature, extent and potential for aquatic macrophyte problem before embarking control measures.

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