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Invasive floating water weeds – killing life and commerce

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Background

Weeds by definition are plants that grow in the wrong place. When their seeds or other plant parts are transported to other regions where their natural enemies are absent, they can multiply unhindered. Indigenous plants, especially those that are adapted for invading disturbed areas, can also become weeds. The first category is a particularly good target for classical biological control. Insects, mites and micro-organisms that feed on them are imported from their original area and released against the new invader. Against indigenous plants however, biological control is far less promising.

By the end of 1980s, many of the water bodies in West Africa were invaded by alien plant species considered to be among the world's worst aquatic weeds: water hyacinth *Eichhornia crassipes*, water lettuce *Pistia stratiotes,* and water fern *Salvinia molesta*. They were accidentally or deliberately introduced as ornamentals or for use in aquariums from their native range South America to many parts of the world where they have become invasive.

Manyfold menaces

In their new geographic range, aquatic weeds multiply rapidly through both vegetative and sexual reproduction; favoured by the absence of their natural enemies and eutrophic nutrient-rich conditions. Consequently, large biomass is produced, most times covering the entire surface of water bodies. The plants threaten the survival of lakeside and riparian communities, kill other aquatic life by blocking out light, harbour the carriers of such diseases as malaria and bilharzia, impede transport, threaten biodiversity, and stifle commerce, fishing and irrigation. In the Congo Basin and in Nigeria, floating water weed have even led to the abandonment of settlements along rivers and lagoons, which became inaccessible.

According to a 2004 report by the African Development Bank (AfDB), annual losses in West Africa vary from US$28-56 million for fisheries, US$4-6 million for health, US$7-14 million for hydro-energy, and US$36-76 million for agriculture. In 1999, the invasion of water fern threatened the rich bird life of the Senegal River Delta, a World Heritage Site that has been designated a Wetland of International Importance under the Ramsar Convention (Diop and Hill, 2009a).

Water way blocked by water hyacinth. – F. Beed

Control options

Floating water weeds can be controlled by several methods, which all have their drawbacks. They include physical means, i.e., hand weeding - the oldest method - or diverse mechanized equipment, chemical herbicides, and biological control. The latter consists of the release of host specific natural enemies, usually insects, mites, also pathogens, introduced from the native range of the weed into the invaded area to reduce the abundance of the weed to a level at which it no longer causes a problem. Utilisation of the water weeds is sometimes considered as a means of control, because large amounts are removed. Some species can be used for the production of biogas, as feed for livestock, for the production of paper, as organic manure, for the treatment of polluted water, and for making ropes, mats, crafts, furniture, etc.

Past control initiatives

Physically removed water hyacinth (foreground) is quickly replaced(background). – F. Beed

Physical removal and herbicides were first seen as the means of choice, but both methods were not sustainable as they only provided temporary control. During a conference in 1988 in Nigeria, participants opted for biological control as the most appropriate method. In Australia, South Africa, Sudan and USA, successful biological control of the three weeds had already been documented. Therefore, in collaboration with other institutions, the International Institute of Tropical Agriculture (IITA) implemented the first classical biological control of floating weeds in West Africa. In 1991, the weevil *Neochetina eichhorniae* was released against water hyacinth in the Ouémé and Niger watersheds in Bénin (Van Thielen et al., 1994). Releases of the weevils *Neohydronomus affinis* against water lettuce in Bénin, and *Cyrtobagous salviniae* in the Congo against water fern, followed thereafter.

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Present control initiatives across the West African Region

Many of the water bodies within the Economic Community of West African States (ECOWAS) are interconnected. Consequently, water weeds spread regardless of political boundaries with one or more species present in the same water body. A management strategy involving the countries that share the affected water basins therefore became necessary. The ECOWAS regional project for the control of aquatic weeds, with funds from AfDB, provides the platform for these new collective efforts. It stipulates active participation of the riparian population, researchers, and extension workers. Countries covered are Bénin, The Gambia, Ghana, Mali, Mauritania, Nigeria, Niger, and Senegal. Water hyacinth, water lettuce, and the less prevailing water fern are the main targets as well as some indigenous species such as *Typha* spp.

Integrated pest management (IPM), depending on biological control, but with physical removal of the weeds in specific locations, and the utilisation of the weeds for composting, is the method of control adopted by the project. Progress has been made in some countries. In Bénin, physical removal and utilisation of water hyacinth is being carried out in Nikouekondji village in Grand-Popo, along the Mono river system. A similar approach is taken in Dangbo community along the Ouémé and Sô river system. The compost manure from physical removal in the communities is used in vegetable production. In Senegal, following the successful biological control of water lettuce and water fern, the focus is now on *Typha* spp. In the other countries, similar efforts are being made.

Due to its experience in biological control of weeds, IITA has been contracted as a key partner in this regional project to empower communities through capacity building and the supply of starter cultures of biological control agents for the implementation of participatory and cost effective integrated control of floating water weeds.

Bénin received starter cultures of *Neochetina eichhorniae* from IITA in December 2009, while Ghana, Niger, and The Gambia have made requests. In Bénin, the mass production of the agents and the field releases will be executed by the Plant Protection Services and Department of Agriculture with technical assistance from IITA. The agents that will be released in the Mono River system, which until 1993 had been free of water hyacinth, will likely spread to the neighboring Togo. In The Gambia, the presence of water hyacinth in the Gambia River represents a risk of invasion into neighboring Senegal. - This highlights the need to urgently implement biological control of water hyacinth in The Gambia.

By bringing together several countries, the ongoing ECOWAS regional integrated control of invasive water weeds is a boost to the past initiatives by single countries. Through active participation of the concerned stakeholders and networking of countries sharing common water bodies, sustainable management of invasive aquatic weeds based mainly on biological control methods can be achieved across the region.

Slow but remarkable results

Reduction in weed cover due to biological control can take several years and will vary according to the weed species, climate, aquatic ecology, and location. In Bénin, about 90% decline in surface cover by water hyacinth was achieved at Tévèdji, a fresh water body, in a period of 8 years (Ajuonu et al., 2003). Biological control of water hyacinth in Bénin is estimated to have brought returns of US$260 million, calculated (with depreciation) over a 20-year period (De Groote et al., 2003). For water lettuce, the surface covers of two water bodies, both in Bénin, were reduced by 75-80% at Sè, and 35-80% at Adjaha, respectively , within five years (Ajuonu and Neuenschwander, 2003), and about 90% in Senegal in one year (Diop and Hill, 2009a). In the case of water fern, 75% reduction was achieved in 2-3 years in the Congo (Mbati and Neuenschwander, 2005), and 95% in one year in Senegal (Diop and Hill, 2009b).

Left: Water lettuce in a lake without biological control agents. – O. Ajuonu

Right: Water lettuce in a lake damaged by biological control agent *N. affinis*. – P. Neuenschwander

Further reading:

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