

SCIENTIFIC FINDINGS

AUGUST 1997 - JUNE 2002

**WATER HYACINTH CONTROL COMPONENT
P.O. Box 1484, MWANZA**

INTRODUCTION

Water hyacinth –*Eichhornia crassipes* (mart) Solms (Pontederiaceae), is widely recognized as the world worst aquatic weed. Likewise, water hyacinth is considered to be the most serious aquatic weed in Tanzania. This free floating plant of South American origin (Jayanth, 1988; Bennet, 1967) was gazetted as a noxious weed in Tanzania for the first time in 1955 in river Sigi and 1964 in river Pangani. In recent years, water hyacinth has spread faster and the most serious infestation is in Lake Victoria (Labrada, 1995). In 1995 about 700 ha of the shoreline including bays and gulfs were infested with water hyacinth and by 1998 the coverage was estimated at 2000 ha (LVEMP, 1999). The growth and spread of water hyacinth posed environmental and socio-economic problems related to the use and management of water resources in Lake Victoria and its basin

To mitigate the water hyacinth problem in Tanzania and Lake Victoria in particular, IPM strategies with emphasis on biological control programme were initiated in 1997. This was done under Lake Victoria Environment Management Project (LVEMP), which is a comprehensive environmental programme that is regional in coverage. Each of the riparian countries (Kenya, Uganda, and Tanzania) carries out water hyacinth control in the Lake Victoria within her boundaries. This paper discusses the use of IPM strategies to control water hyacinth in Tanzania focusing on success achieved so far.

INTEGRATED PEST MANAGEMENT (IPM) STRATEGIES

Management of water hyacinth in lake Victoria basin has been based on;

- Integrating biological control, manual removal of water hyacinth at strategic sites in collaboration with local communities
- Quarantine regulations
- And management of nutrient influx into rivers, ponds and lakes to attain a sustainable management of water hyacinth

i) Biological control

Biological control generally offers sustainable, environmental friendly and long-term control. In Tanzania biological control of water hyacinth was initiated in May 1995. A total of 418 water hyacinths' weevils (*Neochetina eichhorniae* and *N. bruchi*) were imported from IITA Biological Control Centre for Africa, Cotonou - Benin into Tanzania and reared at Kibaha National Biological Control Centre

A total of 9000 adult weevils were released in rivers Sigi and Pangani. *Neochetina* weevils were released for the first time in Lake Victoria in August 1997 followed by subsequent releases covering all the weed-infested bays, gulfs, ponds and satellite lakes. To date twelve (12) weevil-rearing units have been established around Lake Victoria and rivers Kagera and Mara to ensure a sustainable weevil supply for further releases. Assessment of spread and impact of the weevils is done regularly in both release and recovery sites

ii) Physical control of water hyacinth

This involves manual removal of the weed at strategic sites using simple tools and equipment including rakes, wheelbarrows, fork, and machetes. This is aimed at keeping landing beaches, water sources, pumps, and recreational areas free from water hyacinth infestation. The local communities and NGOs are constantly involved in carrying out the removal and identification of the infested sites. Hand tools and protective gears were distributed to the communities by the project to enhance their performance.

iii) Monitoring and evaluation

Monitoring and impact assessment is carried out regularly to provide information on the effectiveness of the control measures and allows assessment to be made of potential control strategies. These involve various methods of surveillance such as ground and aerial surveys in Lake Victoria, rivers, ponds and satellite lakes. And research on the effectiveness of the control strategies, socio-economic impact and ecological succession potential

iv) Quarantine regulations

To prevent the spread of water hyacinth to weed-free areas Water Hyacinth Quarantine Regulations are in place under the Plant Protection Act of 1997 that became operational since July 2001

v) Involvement and participation of local communities

Local communities manage 9 weevil rearing units (3 in Kagera, 2 in Mara and 4 in Mwanza) rearing unit. They rear, harvest and release weevils, participate in monitoring and evaluation of weed infestation and control measures e.g. identification of weed infested hotspots. Further more, they carry out public awareness campaign and manual removal of water hyacinth from strategic sites

vi) Capacity building

Since the beginning of the project, a series of training in form of long and short-term courses, study visits, workshops and seminars have been conducted to components staff, NGOs and communities. Also office equipment such as computers, printers and transport facilities were provided to the component to facilitate implementation of project activities

vii) Control of nutrient enrichment

The nutrient conditions and the tropical environment provide fertile and conducive conditions for rapid growth and proliferation of water hyacinth. Mitigation measures have

been undertaken by soil and Water Conservation, Wetlands and Catchment Afforestation Components/sub-components.

RESULTS/FINDINGS

Generally a dramatic success in water hyacinth infestation has been realised in Tanzania particularly in the Lake Victoria. Water hyacinth is no longer a menace in the Lake Victoria basin. Integrated Pest Management (IPM) has been a success.

i) Biological control

- A total of 105.2 million weevils were harvested from 11 rearing units (no weevils have been harvested from Rusumo-the unit has just been established and operationalized in June 2002), Kibaha Biological control centre, Pangani and Sigi rivers and were released in water hyacinth infested areas in Lake Victoria and other water bodies in its catchments
- It has been established that under Tanzanian conditions the weevils take a shorter period to complete their life cycles. Likewise their generation time is shorter as compared to other countries

Comparison of Neochetina weevil's generation time in days.

	Argentina	Tanzania
<i>N. bruchi</i>	96	60
<i>N. Eichhornia</i>	120	90

This has resulted into having high weevil populations in a shorter period, which contributed positively to the control of water hyacinth

ii) Physical/manual removal

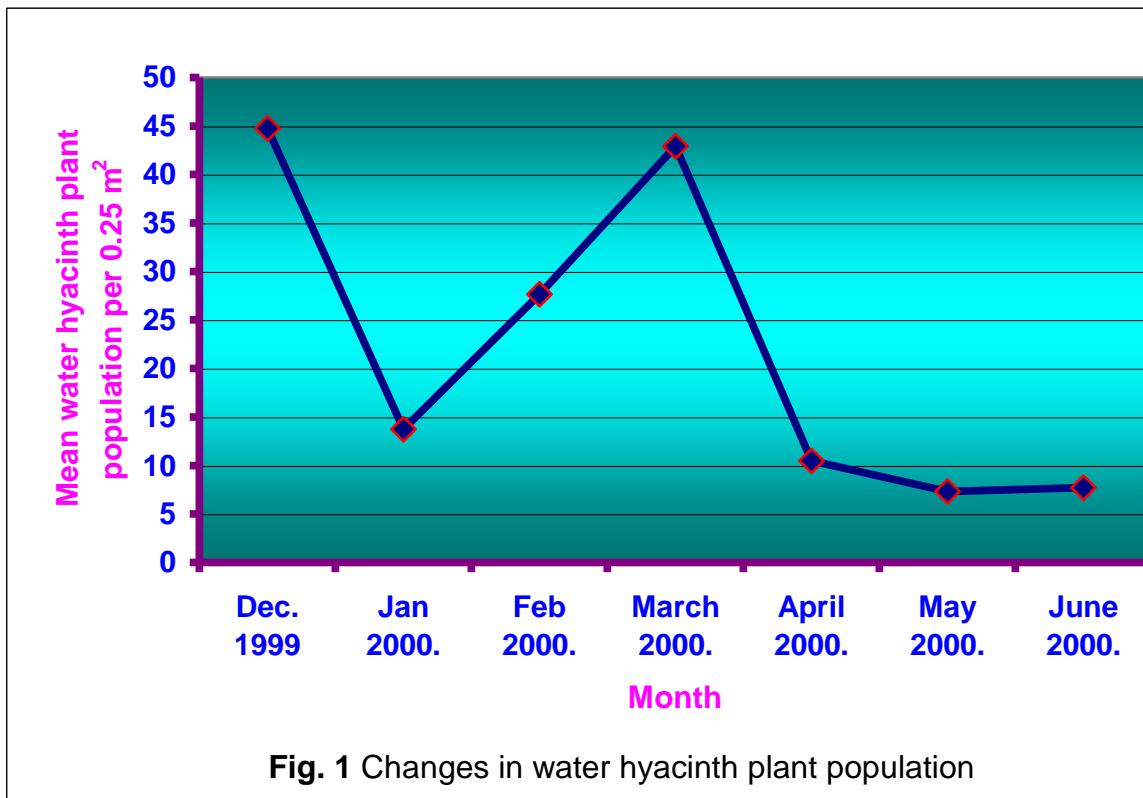
- Through manual removal 530 landing sites and beaches, water points, ferry lines and recreational sites are weed free and therefore easy accessibility for the utilization of water recourses and recreational facilities
- Hand tools and protective gears worth 76 million Tanzanian shillings were distributed to the communities by the project to enhance their performance

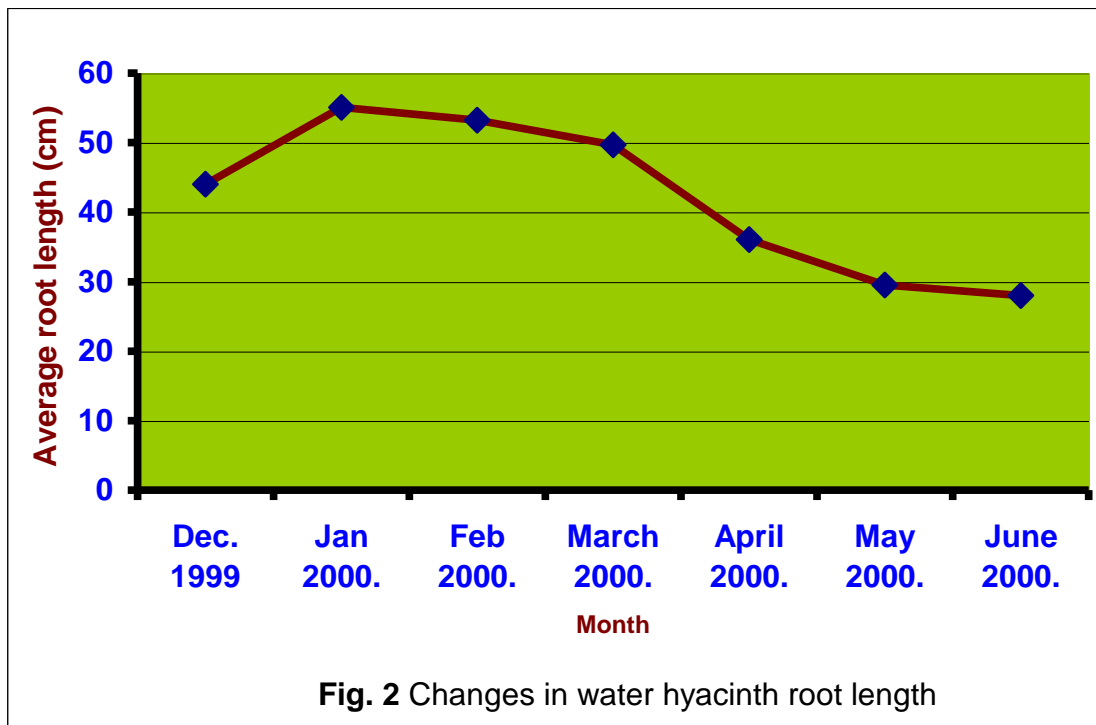
iv) Monitoring and evaluation

a) Surveys in Lake Victoria

- Surveys in 2001 and 2002 surveys confirmed reduction of water hyacinth infestation in the Lake Victoria to be 80% as compared to 70% in 2000

- Data from ground and aerial surveys in Lake Victoria has revealed only localised water hyacinth in Mwanza, Emin Pasha, Bouman, and Speke gulfs and Mara, Rubafu, Nyegezi and Majita bays
- Preliminary weevil impact data (7 months) from stabilised water hyacinth mats has revealed a significant reduction in plant population from 45 to 7 plants/0.5m² and root length from 55 to 27 cm
- The reproductive index of water hyacinth in Lake Victoria has declined from 6 to an average of 0.5 ramets per plant





- Both *N. eichhorniae* and *N. bruch* have equally established in release and recovery sites (adult population of up to 30 per plant) but the efficiency of each species is yet to be established
- Ecological succession is evident in water hyacinth managed sites whereby pure water hyacinth is invaded mainly by water sedges (*Cyperus* sp)

b) Survey of rivers Kagera, Mara, Kahororo and Kanoni

- Repeated surveys of river Kagera revealed that an average of 0.2-0.8 ha of water hyacinth were carried down the river into lake Victoria daily
- Water hyacinth infestation was estimated at 89% in 2001 and has gone up to about 90% in August 2002
- Intensive crop cultivation in river Kagera basin too close to the river bank has lead to soil degradation and nutrient loading in the river that contributes to a continued proliferation of the weed
- Most of the formally cultivated areas have been heavily infested by water hyacinth (2002 August survey)
- Weevil feed marks were rare to find (averaged 0.8 per plant) indicating poor establishment
- The infestation of water hyacinth in river Mara ranged from moderate to high. Near the river mouth infestation was high (13.3 plants/0.25 m² on average) and at times

population of up to 30 plants/0.25 m² was recorded mainly bulbous petiole type signifying low nutrient levels

- Wetland islands (*Typha sp.*, *Papyrus sp.*, *Cyperus sp.* and Hippo grass) containing water hyacinth are being dislodged at middle course of the river and transported to the Lake
- About 60 ha of floating wetland Islands were observed in August 2002 landing and chocking Mara bay
- About 28% of the river bank is infested with water hyacinth plants
- Weevil feed marks average 2.5 per plant (as compared to 3.6 recorded in October 2000 survey)
- Kahororo river was found heavily infested with water hyacinth
- About 2 kilometres from the river mouth is 100% covered with water hyacinth
- Nutrients from livestock keepers and agricultural activities contribute to the weed proliferation
- A good establishment of weevils in river Kanoni has been recorded (approximately 8 adult weevils per plant). This has contributed to low water hyacinth infestation in the river
- Crop cultivation is currently carried out in the reclaimed land

c) Survey of ponds and satellite lakes

- A survey done in 12 ponds and 2 satellite lakes revealed that water hyacinth was present in 11 (78%) of them
- The immediate effect of water hyacinth infestations in the ponds included difficult in accessing water for domestic and irrigation uses owing to the extensive water hyacinth mats and loss of water through evapotranspiration
- In a survey of ponds infected with water hyacinth in Mara region, tortoises were found feeding on water hyacinth leaves, stalks and flowers of water hyacinth leaving the plant completely damaged
- A close investigation revealed that the tortoises could feed better on the plant when not disturbed

d) Socio-economic impact of water hyacinth infestation and control

- 2001 survey showed fishermen changed from fishing to other activities such as farming and petty trading
- Income of fishing communities decreased by < 50% before implementation of water hyacinth control programme (LVEMP)
- Income from fish sells were low (10,300 Tsh. Per day) however, there was an increase by 30% following water hyacinth control
- Communities were generally aware of control measures with positive attitude towards Biological control and IPM in general
- Sampled communities along the lake shoreline and rivers Sigi and Pangani reported that diseases associated with include: Typhoid, Bilharzia, Cholera and parasitic worms

- 62% of the respondents reported loss of fishing gears caused by floating water hyacinth mats

iv) Water hyacinth quarantine regulations

- Water hyacinth regulations were published in official government gazette on 30th November 2001
- All districts in the lake basin infested with water hyacinth were declared under quarantine
- Utilization of water hyacinth is prohibited
- No person shall import or use water hyacinth for commercial, social or any purpose unless such person first obtains a permit from the minister

v) Capacity building

- Two component staff completed MSc. studies and one Diploma course, 5 short courses were undertaken by the core staff and two by the local communities, 5 study visits were made by component staff and communities and 14 workshops, seminars and meetings were attended by component staff and the communities
- Working tools and facilities (both field and office) were supplied to the component and enhanced implementation of activities

vi) Public awareness and dissemination

- 10 (ten) radio and 6 TV programmes have been produced and broadcasted
- 2 posters (600 copies) and 2000 cups produced and distributed to the public
- Awareness campaign workshop conducted whereby 400 people participated
- 10 articles published in local newspapers
- 105 students from universities and secondary schools were assisted by component to carry out their academic projects

CONCLUSIONS

- Water hyacinth in Lake Victoria has been reduced below economic threshold
- However, water hyacinth re-growth (resurgence) has been noted in lake Victoria and hotspots have been identified
- Total coverage is estimated at 878 ha in lake Victoria mainly due to resurgence, water hyacinth inflow from rivers, pollution from different sources i.e. seedling nurseries, oil spillages from car wash, agricultural activities and fluctuations in weevil populations