

## Column John Dawes

### China and the Water Hyacinth



The beautiful water hyacinth (*Eichhornia crassipes*) - popular as an aquarium plant, but more so as a year-round decorative plant for ponds in warmer parts of the world and summer pond decoration in northern climates...as well as a natural spawning medium in commercial fish breeding farms and home aquaria - is causing major problems in many countries, among them, China.

However, it is not the aquatic industry that is responsible for the eco-disaster created by this deceptively delicate-looking plant. This article is aimed at both informing readers about the spread of the plant in China, and at placing the sources of the problem in some form of

perspective, especially with regard to our sector.

Despite its attraction as an aquarium, pond and fish-spawning plant, the water hyacinth was first imported into China in 1901, not as an ornamental plant, but as cattle fodder. In fact, by the 1950s and 1960s, it was distributed for this purpose throughout most Chinese provinces. It was also used - to a lesser extent - as fertiliser and, up to the 1980s, it was used to manufacture paper.

Its first introduction as an ornamental plant, i.e. destined for aquaria and ponds, was in 1903 when specimens were introduced into Taiwan "from



Dense clump of deceptively innocent-looking...and beautiful...waterhyacinths.

Photo: John Dawes



*These water hyacinths were photographed on the banks of the Pearl River that runs through Guangdong Province in southern China.* **Photo: John Dawes**

Southeast Asia". While this source sounds somewhat vague - in view of the large area covered by Southeast Asia - it nevertheless confirms that this South American species was already in the region more than 100 years ago.

#### **Wide Distribution**

During the 1970s, water hyacinths were transplanted and mass reared in many areas, and began causing significant damage from the 1980s onwards. Today, the plant is officially recorded as established and reproducing in no fewer than 17 Chinese provinces.

In Guangdong, Yunnan, Fujian, Zhejiang and Taiwan, it is now regarded as a "bio-disaster". Hyacinths are also present in several other (colder) provinces, where they are used mainly as animal fodder, but where they die during winter.

An idea of the scale of the problem is provided by Shanghai. In 2002, 1.68 million tons of water hyacinths were removed from the Huangpujiang River and other bodies of water in Shanghai, with the operation costing US\$10 million. Since then, Shanghai has invested over US\$1.2 million in a project of integrated management of the water hyacinth.

#### **Multi-faceted Threat**

The threat posed by the water hyacinth is multi-faceted. The most obvious of these is that it competes with native plants for space and nutrients. But this is only the beginning. In some sites in southwestern China, for example, it has "greatly reduced" native plant diversity, not just through direct competition, but through water pollution once the hyacinths die and sink. In Coohai, the number of native plant species dropped from 16 in 1960, to just three in 1990. If the plants are collected and piled up on land, this, too, causes heavy pollution and environmental degradation when the plants decay and the runoff finds its way into the local water courses, ponds and lakes.

The water hyacinth has also been implicated in human health problems since the dense mats of the plant create ideal conditions for mosquitoes and flies. Even public security appears to be affected because it is claimed that "dense and high water hyacinth plants provide a nice place for criminals to hide."

In terms of control methods, physical removal, which now costs over US\$12 million per year, is considered uneconomic and ineffective and cannot provide long-term control. This method is therefore only practised in a few places these days.

The use of chemicals also has its problems, especially in areas where the water colonised by the hyacinths is also used by people and their animals. Chemicals also have the disadvantage that, while they may effectively control the weed, their effectiveness results in the death of such high numbers of plants that dissolved oxygen levels result, which, of course, are harmful to fish.

### Hopeful Developments

There is, however, a ray of hope on the chemical front. A chemical compound (KWHO2) has recently been developed which inhibits asexual reproduction in the water hyacinth. This method of reproduction, in which plants produce large numbers of offsets throughout the growing season (about six every 26 days), is the fastest way in which the water hyacinth spreads.

It has been found in experiments carried out in concrete pools that KWHO2 inhibits asexual reproduction (reducing it by up to 70%). Since the treatment does not result in the death of the plants, the water pollution problems encountered with mass eradication chemical treatments do not arise. Further, toxicity tests reveal that KWHO2 can be categorised as a low-toxicity herbicide. Indeed, skin and eye irritation tests showed no negative effects. Finally, KWHO2 decomposes rapidly in water, thus posing no risk of long-term accumulation. The herbicide has now been used around Shanghai as part of an integrated management programme and has "gained immediate success."

Another component of these integrated programmes includes the use of the weevil, *Neochetina eichhorniae*, which has a voracious appetite for water hyacinths, but not for other plants. A success rate of around 90% has been obtained under experimental conditions, making the weevil a good candidate for use as a biological control agent. Presumably, any fears associated with potential problems caused by the weevils once the hyacinths are controlled or eliminated are minimised by the weevils' very specific hyacinth-based diet.

A further line of control is also now being followed. As from 2000, research has been carried out at Shanghai Jiao Tong University to control water hyacinths using micro-organisms. So far, nine species of fungus have been isolated from water hyacinths and these show varying effects on the growth of the plant. Further research is, obviously, necessary, but the evidence obtained so far indicates that this line of enquiry could yield valuable results.

The battle against the exotic and impressive water hyacinth is, obviously, receiving a great deal of attention, and achieving some notable victories in China. Important lessons are also being learned which will, hopefully, help other countries and regions to tackle this spectacular pest.



*A newly-developed compound inhibits the formation of offsets produced by water hyacinths and could offer hope in the battle against this invasive plant.* **Photo: John Dawes**

NOTE: While there are quite a few scientific papers dealing with the problems faced by China with regard to the water hyacinth, a particularly useful (and brief) recently-published report is the following: Chu Jian-jun, Ding Yi and Zhuang Qi-jia (2006), Invasion and control of water hyacinth (*Eichhornia crassipes*) in China. *Journal of Zhejiang University SCIENCE B*, Vol. 7 (8): 623-626.

This paper can be accessed via: [www.zju.edu.cn/jzus](http://www.zju.edu.cn/jzus). This will take you to the Journal homepage. Click on the JZUS Archives in the menu list and then simply key in: water hyacinth in the search box and click. This will take you to the available pages in the archives dealing with water hyacinths, which can be directly accessed from here.