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Can Water Hyacinth Clean Highly Polluted Waters?

—A Short Paper for Discussion

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ABSTRACT

Recently local government and environmental protection authorities in China have turned to the water hyacinth, one of the world's worst aquatic weeds, to reduce nutrient concentrations in highly eutrophic lake waters, especially in Lake Dian in southwestern China's Yunnan Province. Although we do not reject using water hyacinth to reduce lake eutrophication, it is not a complete solution. In our view, a more complete solution requires a holistic consideration of watershed or drainage characteristics, and a solid understanding of the limnological features of individual lakes. Before the bio-geochemistry and toxicological effects of water hyacinth be thoroughly understood, applying it widely to lake restoration and overstating its practical value is not only irresponsible but also dangerous.

Keywords: Water Hyacinth; Lake Eutrophication; Lake Dian; SW China

There have been years of struggle and hundreds of millions of RMB Yuan spent to restore hypereutrophic lakes in China, such as Lake Tai or Taihu in southeastern [1,2] and Lake Dian or Dianchi in southwestern China. Recently local government and environmental protection authorities have turned to the water hyacinth to try to reduce nutrient concentrations in eutrophic lake waters (**Figure 1**). This action has stirred a fierce public debate, as supporters vehemently embrace this approach to restoring water quality in lakes. Meanwhile, skeptics reject the use of water hyacinth, calling it "a dangerous game" that only "treats the malignant disease with poisonous agents". This is because, for a many years, water hyacinth, or *Eichhornia crassipes* (Mart.) Solms, has being classified as one of the world's worst aquatic weeds [3,4] and has been nominated as among the "world's worst" invaders. As "the beautiful blue devil" it causes problems for people around the globe [5,6]. In China, people has just relived from the long-term struggling to eradicate rapid wide spreading Water Hyacinth imported during 1960's.

As an example, 26 km^2 of water hyacinth have been cultivated in Dianchi in 2011 to try to alleviate eutrophication in the lake. As a result, it is reported that the lake water is becoming more or less cleaner than before, but the question remains as to how permanent the effects of this remediation will be. Furthermore, it is also uncertain if treating < 10% of the total lake area with water hyacinth will improve overall water quality across the entire lake, including the untreated areas.

A carefully thought-out water management plan is essential. One unforeseen consequence of hasty action could be that water hyacinth would increase but without decreasing the dissolved nutrient content of the water. If this situation develops, it would be truly to be a case of "pouring toxins into the poison" that would only worsen, not improve, lake water quality and ecology.

It is not my intention to suggest the introduction of water hyacinth will not reduce lake eutrophication, assuming the procedure is economically feasible. However, it cannot be a complete solution. Furthermore, the Water Hyacinth dominated plant is also against the principle of biodiversity. In my view, a more complete solution requires a holistic consideration of watershed or drainage characteristics, and a solid understanding of the limnological features of individual lakes. Decisions should be made on solid scientific evidence. Decision makers need to be patient enough to give more time to acknowledged scientists to reach mature study results and evidence-based conclusions, instead of forcing or seducing scientists to reach conclusions biased by policy-makers. At the same time, scientists should maintain their independence instead of using their position to "Hujo" both the public and government to benefit only themselves.

We should not be overconfident and prematurely celebrate victory over algal blooms and lake eutrophication. In fact, cultivation of water hyacinths still carries considerable uncertainty, and it may just shift the problem from

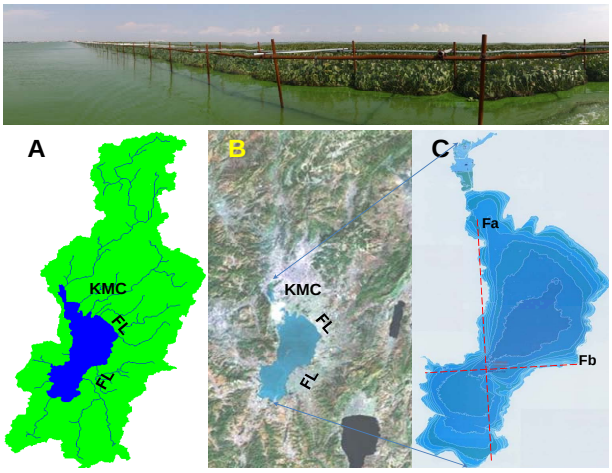

Figure 1. Lake Dian (with a lake area of 298 km^2 and an average water depth of 5 m) and its drainage area (with a total area of 2781 km^2, (A). The lake's water supply comes mostly from the north flowing through the city of Kunming (KMC) with a total population of 7.29 million in 2011 (B). The lake is also surrounded by extensive farmlands (FL). The stomach-shaped lake receives large amounts of nutrients and heavy metals from both the city and neighboring farmland, making the lake hypereutrophic (Top, photograph taken on 12 Oct. 2011, which shows both water hyacinth and algae flourishing together). A potential danger is the cross-cutting faults Fa and Fb, as they might not only induce future earthquakes but also drain the lake water, because at the cross point a 11.35 m water deep funnel already exist (C), water depth data is after the Bureau of Yunnan Provincial Environmental Protection, 2010).

tiny algae to large weeds, neither of which humans can handle. This could be a case of the "wolf to watch over the sheep". One of the major challenges is how to deal with the vast amount of water hyacinth collected from toxic waters, as it has been announced that 3.6×10^8 kg of ripe water hyacinth from Dianchi needs to be collected from October to the end of the year 2011. The ambitious attempts to exploit the harvested water hyacinth are hindered by its high pH values (>9), and high organic elemental contents and potentially toxic heavy metals. I urge extreme caution here: the bio-geochemistry and toxicological effects of water hyacinth must be thoroughly understood before applying it widely to lake restorations.

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REFERENCES

[1] R. Stone, "China Aims to Turn Tide against Toxic Lake Pollution," *Science*, Vol. 333, No. 6047, 2011, pp. 1210-1211. doi:10.1126/science.333.6047.1210

[2] L. Guo, "Doing Battle With the Green Monster of Taihu Lake," *Science*, Vol. 317, No. 5842, 2007, p. 1166. doi:10.1126/science.317.5842.1166

[3] S. C. H. Barrett, "Waterweed Invasions," *Scientific American*, Vol. 264, No. 4, 1989, pp. 90-97.

[4] L. G. Holm, D. L. Plucknett, J. V. Pancho and J. P. Herberger, "The World's Worst Weeds: Distribution and Biology", Kreiger Publishing Co., Malabar, 1991.

[5] J. D. Madsen, "Growth and Biomass Allocation Patterns during Water Hyacinth Mat Development," *Journal of Aquatic Plant Management*, Vol. 31, 1993, pp. 134-137.

[6] N. D. Vietmeyer, "The Beautiful Blue Devil," *Natural History*, Vol. 84, 1975, pp. 64-73.

