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NOTES

Biological Control of Water Lettuce

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INTRODUCTION

Water lettuce (*Pistia stratiotes* L.) is a free-floating aquatic plant and is one of the most widely distributed of all hydrophytes, occurring throughout the Tropics and Subtropics in diverse aquatic habitats. It is a serious weed in Africa, India and south-east Asia (2, 4). Water lettuce resembles waterhyacinth (*Eichhornia crassipes* (Mart.) Solms-Laubach) and salvinia (*Salvinia molesta* D. S. Mitchell) in forming dense floating mats which interfere with navigation, hydroelectric generation, fishing and paddy crops. Water for agriculture is often lost through transpiration and the weed is a breeding site for mosquitoes which are the principal vectors of malaria, encephalomyelitis and rural filariasis (4).

In Australia, water lettuce is not as troublesome as waterhyacinth and salvinia, but significant infestations have occurred in coastal Queensland and the weed is listed as one of the most troublesome plants in channels and streams (5). As part of a program undertaken by CSIRO, Australia, for the biological control of floating aquatic weeds, exploratory studies were carried out in South America, mainly in Brazil. We report the effects of the weevil, *Neohydronomus pulchellus* Hustache on an infestation of water lettuce in south-east Queensland, Australia.

MATERIALS AND METHODS

N. pulchellus was assessed by DeLoach *et al.* (3) as a potential agent for the control of water lettuce. A colony of the weevil was collected at Pelotas, Rio Grande do Sul, Brazil and introduced to Australia in March 1981. Studies in Australia of the biology and host specificity of this weevil confirmed its suitability as a biological control agent for water lettuce. Adults and larvae were liberated at five experimental sites between March and November 1982 where they readily established.

The site chosen for these studies was at Park Ridge, near Brisbane. The site has three dams, each between 500 and 600 m^2 in area and 20 to 50 m apart, on a stream which usually has little water flow. These dams had a history of being covered by a thick mat of water lettuce. In March 1982 *ca.* 3,000 adults and larvae (in infested plants) of *N. pulchellus* were liberated at the second dam.

RESULTS AND DISCUSSION

Two months after release of *N. pulchellus,* plants were rotting and sinking adjacent to the liberation site. A further 1,000 adults and larvae were liberated in June 1982 and by September, six months after initial liberation, the weevil had spread over the entire infestation. By November 1982, eight months after liberation of the weevil, *ca.* one third of the plants in dam 2 were chlorotic and some had been destroyed. The weevils had spread to the first (upstream) dam by November, and a month later, one half of the plants on the second and *ca.* one tenth of those on the first were heavily damaged and were chlorotic or rotting. By January 1983 weevils had spread to the third (downstream)

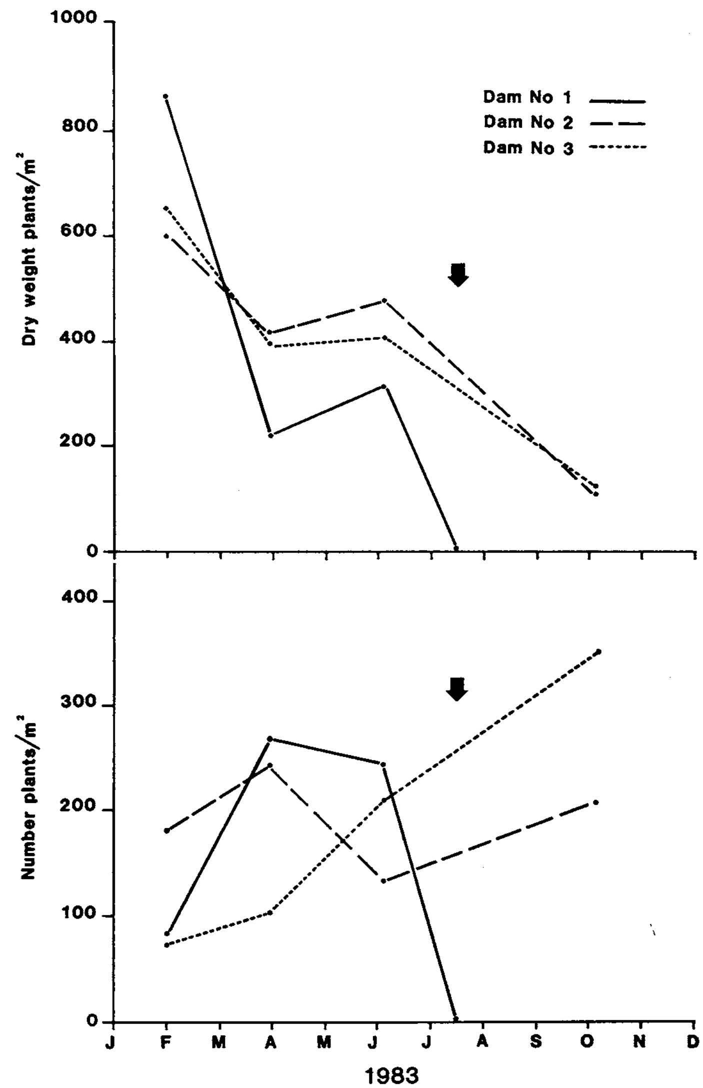

Figure 1A (Top) and 1B (Bottom). Changes in the actual infestation of water lettuce on dams 1, 2 and 3 at Park Ridge from January to October 1983: (1A) weight of plants/m²; (1B) number. (down arrow) indicates flushing of dams 1 and 2 following heavy rain.

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dam. Weevil attack between January and July 1983 caused a reduction in the area of infestation and the weight of plants/m^2 within the infestation. Severely damaged plants produced short stolons terminating in small plantlets (1) before sinking and dying but these failed to grow to the size of their parents before they too were severely damaged, produced plantlets and then sank. The result of continued weevil attack was an increase in the number of plants per unit area (Figure 1B) and a decrease in the size and dry weight of plants (Figure 1A).

Heavy run-off following rain in July 1983 flushed much of the remaining water lettuce from dams 1 and 2. The water lettuce in dam 3 was not altered as the stream flowed to one side of this dam. Weevil attack continued on the residual infestations in dams 1 and 2 and the infestation in dam 3 with the weight of plants/m^2 being further reduced. The changes in the infested area on these dams between March 1982 and October 1983 were dramatic. Dam 1 became completely clear of water lettuce, the infestation on dam 2, which formerly was totally covered by an estimated 758 kg dry weight of this weed, was reduced to 4.6 kg occupying 7% of the dam and on dam 3, which was not flushed out, it was reduced from an estimated 327 kg to 60 kg.

Similar rapid establishment of *N. pulchellus* and reduction of more extensive infestations of water lettuce have been recorded at the other experimental sites. For example, at Bundaberg clear water and reduction in plant size was recorded seven months after the initial liberation and it is anticipated that similar results will be achieved in other areas with water lettuce in Australia.

Classical biological control of water lettuce has not been attempted previously and this outstanding success with the weevil, *N. pulchellus* is notable. It is probable that *N. pulchellus* would affect similar control in Africa, India and south-east Asia.

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