Distribution and densities of *Cyrtobagous singularis* Hustache (Coleoptera: Curculionidae) on *Salvinia molesta* Mitchell in the Eastern Caprivi Zipfel

by

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ABSTRACT

The weevil *Cyrtobagous singularis* Hustache has established itself on the weed *Salvinia molesta* Mitchell in the Eastern Caprivi Zipfel, SWA/Namibia. It is distributed throughout the swamp and river system. Population densities are low and the effectiveness of *C. singularis* as a biological control agent has not been determined.

KEY WORDS:

Cyrtobagous singularis, Coleoptera, Curculionidae, *Salvinia molesta*

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1 INTRODUCTION

The Eastern Caprivi Zipfel, which borders on Angola in the north-west, Zambia in the north, Zimbabwe in the east and Botswana in the south and south-west, is infested by the weed *S. molesta*. Most of the boundaries are permanent rivers i.e. the Zambezi in the north and the Kwando-Linyanti-Chobe system in the west, south and east.

The weed was introduced from an unknown source in the upper Zambezi (Edwards and Thomas, 1977). It was first recorded at Katombara, 55 kilometres up-stream of the Victoria Falls in 1948 (Sculthrope, 1967). *S. molesta* has since been spread both up-stream and down-stream by human activity and natural extension.

The first releases of *C. singularis* Hustache (originally collected from *Salvinia auriculata* Aubl.) were made by N.S. Irving who released a total of 1 300 adults between 1972 and 1974 at various points on the Chobe and Linyanti Rivers (Edwards and Thomas, 1977). In 1975 a joint South African — Botswana control programme of the weed was initiated using both chemical and biological methods, but was later discontinued. During the programme 250 adult *C. singularis* were released on the Linyanti River (Edwards and Thomas, 1977).

According to Edwards and Thomas (1977) no recoveries could be made and it was assumed that the insects had not established themselves successfully. This proved to be wrong when, in 1981, the author recovered *C. singularis* from *S. molesta* on Lake Liambezi.

2 MATERIALS AND METHODS

2.1 Distribution

For a year *S. molesta* samples were collected throughout the region to establish the distribution of *C. singularis*. To confirm the presence of *C. singularis*, the

leaves and apical buds of *S. molesta* were inspected for characteristic damage. Both the British Museum (Natural History) and Dr D.P. Sands of the Entomology Division of C.S.I.R.O. in Australia, confirmed that the recovered insects were *C. singularis*.

2.2 Density

Samples were taken at four localities.
Ngoma — 24°51'E, 17°55'S
Lisikili — 24°21'E, 17°29'S
Linyanti — 24°01'E, 18°08'S
Muyako — 24°31'E, 17°46'S

At each sampling site 2 to 5 kg wet mass of *S. molesta* was collected. The samples were transported to the laboratory at Katima Mulilo, where they were weighed on the same day. The insects were extracted using Berlese Funnels (Boland and Room, 1983), counted, and the density of *C. singularis* per kg wet mass of *S. molesta* was calculated.

3 RESULTS AND DISCUSSION

3.1 Distribution

It was found that *C. singularis* occurs all along the Zambezi and its backwaters, throughout the Chobe/Linyanti system, and on the Kwando, at least as far north as Balelwa. Adult insects were collected and evidence of damage noted at all the sites sampled.

C. singularis has thus become firmly established on *S. molesta* in the Eastern Caprivi. More research is required to determine the effectiveness of *C. singularis* as a biological control agent for this weed.

3.2 Densities

The densities of *C. singularis* per kg fresh *S. molesta* for the four localities are presented in Table 1.

The insect densities are low at all four sites. These densities are also low when compared to those recorded in Australia for a *Cyrtobagous* sp. which is closely related to *C. singularis* and host specific to *S. molesta*. The highest density of *C. singularis* recorded in East Caprivi was 8,9 adults per kg wet mass *S. molesta* at Lisikili in May (Table 1), whereas Room *et al.* (1984) recorded 101 adults of a *Cyrtobagous* sp. per kg wet mass in Australia.

The main reason for the low densities of *C. singularis* on *S. molesta* in the Eastern Caprivi is probably that the weevil prefers *S. auriculata* as host, and therefore it is not thriving, but merely surviving on *S. molesta*. A further reason for the low insect densities could be the relatively low nitrogen content of the plant material in this region (Toerien *et al.*, 1984). These insects are sensitive to low nitrogen concentrations in the host plant (Sands *et al.*, 1984).

Densities at Ngoma Bridge (Chobe River) seem to show a slight increase towards late summer with the highest densities in April (Table 1). Densities on the Linyanti River were even lower than those on the Chobe River. The highest value recorded on the Linyanti was 2,38 adults per kg fresh plant material, in March (Table 1).

Lisikili (a backwater of the Zambezi River) too showed an increase in adult insect densities towards late summer, but on Lake Liambezi, a decline was evident towards the end of summer (Table 1).

This seasonal increase in insect densities is possibly due to the fact that surface water temperatures ranging from 20°C to 32°C are optimal for insect development from spring to autumn.

Forno *et al.* (1983) found that a closely related species of *Cyrtobagous,* host specific to *S. molesta,* develops most rapidly at temperatures between 19°C and 31°C.

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TABLE 1: Mean number of adult *Cyrtobagous singularis* extracted per kg fresh *Salvinia molesta* at four localities in the Eastern Caprivi.

Date	Ngoma		Lisikili		Linyanti		Muyako	
	No. of samples	Mean no. of adults S.D*	No. of samples	Mean no. of adults S.D*	No. of samples	Mean no. of adults S.D*	No. of samples	Mean no. of adults S.D*
January 1984	2	1,99 ± 1,04	—	—	2	0,13 ± 0,19	4	4,12 ± 2,23
February 1984	4	0,19 ± 0,22	4	1,55 ± 0,39	4	1,91 ± 0,96	7	2,75 ± 1,92
March 1984	6	0,92 ± 0,45	3	1,34 ± 1,35	6	2,38 ± 2,94	8	1,68 ± 1,09
April 1984	6	5,24 ± 3,13	8	3,00 ± 1,76	6	0,72 ± 0,37	—	—
May 1984	6	3,96 ± 3,45	4	8,90 ± 3,44	2	0,90 ± 0,45	—	—

* S.D. = Standard Deviation

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