

The distribution and abundance of the stem-galling fly, *Cecidochares connexa* (Macquart) (Diptera: Tephritidae), a biological control agent of *Chromolaena odorata* (L.) (Asteraceae), in Ghana

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Chromolaena odorata (L.) R.M. King and H. Robinson (Asteraceae: Eupatorieae) is one of the worst invasive weeds in West Africa, and a serious biotic threat to food security. The stem-galling fly, *Cecidochares connexa* (Macquart) (Diptera: Tephritidae), a biological control agent for *C. odorata*, was released in the Ivory Coast in 2003 and first detected in Ghana in 2014. The spatiotemporal distribution and abundance of *C. connexa* in Ghana was determined by country-wide surveys from 2015 to 2016. Galls were found in varying densities across Ghana but gall densities were consistently low east of Lake Volta. A limited survey conducted in the extreme west of Togo in 2016, found the gall fly also in low numbers. There was a significant correlation between *C. connexa* gall densities and the distance from the release sites in the Ivory Coast. The distribution and abundance of the gall fly in Ghana could be explained by its spread from the original release sites over time and/or the much drier conditions east of Lake Volta. *Cecidochares connexa* has dispersed a distance of about 1000 km over a 10-year period and, while there is some evidence that the gall fly is still dispersing towards the east, its range and population size could be limited by the dry climatic conditions in the east of Ghana and in Togo. Actively redistributing the agent over this dry corridor to the more humid and higher rainfall areas of Nigeria, may result in the spread of this agent through the rest of West and Central Africa, thereby aiding the control of *C. odorata* in the region.

Key words: weed biological control, gall fly, agent dispersal, spatiotemporal distribution, climatic suitability, West Africa.

INTRODUCTION

Chromolaena odorata (L.) King and Robinson (Asteraceae: Eupatorieae), often referred to as 'Akyeampong' in Ghana, is a neotropical shrub that has invaded numerous countries in Africa, Asia and the western Pacific, threatening biodiversity and food security (Zachariades *et al.* 2009). The weed was first detected in Ghana in 1969, at the Legon Botanical Garden (LBG) (Hall *et al.* 1972), and two decades later, it had invaded about 75 % of the total land area of the country, occupying many different habitats (Timbilla & Braimah 1996).

Biological control of *C. odorata* in West Africa began in the 1970s, when two biocontrol agents, *Pareuchaetes pseudoinsulata* Rego Barros (Lepidoptera: Erebididae) and *Apion brunneonigrum* Béguin-Billecocq (Coleoptera: Brentidae) were introduced unsuccessfully into Nigeria and Ghana (Cock & Holloway 1982). In the early 1990s, *P. pseudoinsulata* was re-introduced in Ghana, as part of a new biological control programme against *C. odorata* (Timbilla & Braimah 2000) and subsequently established (Braimah & Timbilla 2002). However, nine years after an earlier study reported its



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