

RELEASE OF *PAREUCHAETES INSULATA* (LEPIDOPTERA: ARCTIIDAE) AGAINST *CHROMOLAENA ODORATA* (ASTERACEAE) IN KWAZULU-NATAL

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Abstract

In late 2000, *Pareuchaetes insulata* was collected from *Chromolaena odorata* in Florida, USA, and sent to the Agricultural Research Council's Plant Protection Research Institute quarantine laboratories at Cedara, KwaZulu-Natal (KZN). Upon its release from quarantine, it was sent to the South African Sugar Association Experiment Station insect unit for mass propagation. The first insects were released in early March 2001 and, since then, in excess of 650 000 *P. insulata* have been released. Initial releases were spread throughout coastal KZN, with each release site receiving 20 000 individuals. During releases, heavy defoliation of *C. odorata* was noticed, but subsequent surveys after releases were terminated provided no evidence of establishment. In 2002, it was decided to concentrate releases in two release areas, one of the south coast and another on the north coast of KZN. Heavy defoliation was again recorded at these sites during releases, and also considerable spread of *P. insulata* at the south coast site. This paper records the release sites used, and shows the impact caused by *P. insulata* while releases were in progress. It also discusses the suitability of the Floridean strain of *P. insulata* for use against *C. odorata* in KZN, and the way forward.

Keywords: weed biocontrol, releases, *Pareuchaetes insulata*, *Chromolaena odorata*, KwaZulu-Natal

Introduction

Despite providing in excess of 148000 *Pareuchaetes aurata aurata* (Butler) (Lepidoptera: Arctiidae) between 1992 and 1994 from a mass rearing colony established at the South African Sugar Association Experiment Station (SASEX) insect unit (Conlong and Way, 2000), they apparently failed to establish on *Chromolaena odorata* (L.) King and Robinson (Asteraceae) at numerous field release sites in KwaZulu-Natal (KZN) (Conlong, 2000). However, the success attained by Ghanaian workers in establishing a related species, *Pareuchaetes pseudoinsulata* Rego Barros (Lepidoptera: Arctiidae), on *C. odorata* in regions of Ghana following repeated releases over a three year period (Brimah and Timbilla, 2000), prompted renewed interest in testing species of *Pareuchaetes* against this weed in South Africa (Strathie-Korrûbel and Zachariades, 2000). *Pareuchaetes pseudoinsulata* had been introduced and tested against South African *C. odorata*, but rearing colony diseases, and voracious predation by ants (Kluge and Caldwell, 1996), were cited as reasons for its failure to establish.

Because of its different oviposition habits, *Pareuchaetes insulata* was recently imported by the Agricultural Research Council's Plant Protection Research Institute (ARC-PPRI) for testing against *C. odorata* in South Africa at sites in KZN (Zachariades *et al.*, 1999), and was mass reared under controlled conditions at the SASEX insect unit at Mount Edgecombe (Walton and Conlong, 2003). Climate matching showed the St Lucia area of KZN to match fairly closely with the area in Florida, USA, from which it was collected. There were also fairly good matches with other areas along the KZN coast (Parasram *et al.*, 2000), and it was thus considered appropriate that this insect be released in KZN.

Materials and methods

Pareuchaetes insulata was reared as described by Walton and Conlong (2003). Once the laboratory colony was established, and all rearing operations were completed on a daily basis, all excess first instar larvae and other life stages, i.e. those not needed for laboratory colony maintenance, were available for field release. Release sites were chosen by the biocontrol Implementation Officer of the Working for Water (WfW) programme of the Department of Water Affairs and Forestry (DWAFF), in conjunction with the ARC-PPRI weed biocontrol specialist entomologists, and for the first year of releases, a limit of 20 000 larvae was set per release site. Larvae were released on a weekly basis, by removing the bouquets of *C. odorata* on which they were feeding in the release boxes, removing the plant cuttings carefully from the Oasis, and placing the cuttings and larvae carefully onto the *C. odorata* at the same location on the site chosen until the limit was reached. All larvae on the Oasis, and loose in the release box, were also carefully removed and placed on the *C. odorata* at the chosen release site.

During the second year of releases, it was decided to follow the example of the Ghanaians, who concentrated their releases in fewer areas, and released continuously into these for three years. As a result, sites were chosen on the south and north coasts of KZN, and all larvae provided for release were placed, at fortnightly intervals, in the selected areas as described above.

Results and Discussion

Table 1 lists the sites chosen for the first year period of 20 000 larvae released per site, the exact location of each site, the period through which they received the larvae and the total number of larvae received.

At some of the drier sites, e.g. Hluhluwe Game Reserve, the Ntambanana sites and Hawaan forest, the *C. odorata* in the release areas lost all their leaves, subsequent to releases being completed. There was thus no food material left on which the larvae could feed. However, while releases were in operation, feeding damage was clearly evident at all sites (see Figures 1 and 2), as were all larval instar stages. At Ntambanana, adults were seen flying at night, indicating that some larvae had developed through the pupal stage and become adults. Unfortunately, within two months of the releases being terminated, no more larvae or other life stages could be found at the release sites.

It was thus decided to concentrate releases in fewer areas for longer periods. Table 2 summarises these, and lists the sites chosen, their exact localities, and number of *P. insulata* released into them.

Table 1. Sites used for the release of *Pareuchaetes insulata* in KwaZulu-Natal from 1 January 2001 to 13 February 2002.

Site	Site	Latitude (S)	Longitude (E)	No. of larvae	No. of adults	Starting date	Last release	Completed
1	Hluhluwe Game Reserve	28° 06.634	32° 03.801	18 368	0	01/23/01	03/29/01	Y
2	Umhlanga, Hawaan Forest	29° 42 072	31° 05 405	19 991	113	01/24/01	05/23/01	Y
3	Ntambanana No. 1	28° 34.876	31° 46.625	26 253		04/05/01	05/22/01	Y
4	Ntambanana No. 2	28° 34.664	31° 46.739		937	04/23/01	05/22/01	Y
5	Mkuze (fig forest), site 1	27° 40.169	32° 19.324	22 450		05/14/01	07/23/01	Y
6	Mkuze (fig forest), site 2	27° 40.142	32° 19.360		1013	05/14/01	06/21/01	Y
7	New Germany	29° 48.672	30° 53.977		6291	05/01/01		N
8	Cannonbrae, site 1	30° 13.236	30° 46.879	293 439		06/28/01		N
9	Cannonbrae, site 2	30° 13.315	30° 47.127		709	06/28/01	07/24/01	Y
10	Monzi Golf Course	28° 25.797	32° 18.059	16 059		08/07/01	11/06/01	Y
11	Honeymoon Bend Island	28° 23.220	32° 24.171	25 870		08/23/01	10/10/01	Y
12	Vernon Crookes GR	30° 16.444	30° 37.100	18 835		10/01/01	10/31/01	Y
13	Eastern shores, St. Lucia	28° 07.984	32° 29.520	6 187		10/09/01	10/09/01	Y
14	Mbumbazi NR	30° 48.594	30° 16.707	45 910		11/15/01	04/17/02	Y
15	Fanie's Island	28° 07.203	32° 25.903	14 741		11/22/01	01/14/02	Y
16	Mkuze, Msunduze	27° 44.882	32° 17.252	101 043		11/23/01		N
17	Richards Bay	28° 46.256	32° 07.367	93 658		06/12/02		N
18	Nagle Dam	29° 34.447	30° 37.037	3 900		12/31/02		N
Total				702 804	9063			

Table 2. Sites used for the release of *Pareuchaetes insulata* in KwaZulu-Natal from 1 April 2002 to 13 February 2003.

Site	Latitude (S)	Longitude (E)	No. of larvae	No. of adults	Starting date
Cannonbrae, Umkomaas	30° 13.236	30° 46.879	249 609		06/28/01
New Germany	29° 48.672	30° 53.977		2 768	05/01/01
Mbumbazi NR	30° 48.594	30° 16.707	5 385		11/15/01
Mkuze, Msunduze	27° 44.882	32° 17.252	45 490		11/23/01
Richards Bay	28° 46.256	32° 07.367	93 658		06/12/02
Nagle Dam	29° 34.447	30° 37.037	3 900		12/31/02
Total			398 042	2 768	

Tables 1 and 2 have two sites in common, Cannonbrae and New Germany Nature Reserve. The former was established in June 2001 and, during releases, many larvae were spotted at the release sites, and satellite colonies were found some distance from the release site. Cannonbrae was therefore chosen to receive many more than the 20 000 larvae originally designated for release at this site. Similarly, New Germany Nature reserve received all the excess adults from the time these were produced until the present.



Figure 1. Leaves eaten entirely except for the midrib, by *P. insulata* larvae at Cannonbrae.



Figure 2. Leaf damage to seedlings by *P. insulata* at Ntambabana release site.

As releases at the sites listed in Table 2 had just been completed at the time of writing, it is too early to determine whether colonisation has taken place. However, this paper covers only the first year of releases of the Florida strain of *P. insulata* at selected sites in KZN. To achieve a similar level of success as that of Ghana in establishing *P. pseudoinsulata* on *C. odorata* in that country, two or more years of releases should take place.

Conclusion

Since releases commenced in 2001, more than a million *P. insulata* larvae and 11 000 pupae have been released at 18 sites on the coast of KZN. At all sites copious feeding was observed while releases were in progress and, at Cannonbrae, satellite colonies of larvae were found some distance from the release site. However, at the time of writing no firm evidence of establishment of *P. insulata* has been found.

However, subsequent to the commencement of this project, recent evidence has been produced which shows that the *C. odorata* biotype present in South Africa is not as closely related to the Florida biotype (from which the current population of *P. insulata* was collected), as to biotypes of *C. odorata* in Jamaica and Cuba.

Zachariades (2003) discusses these, and the prospects for the establishment of populations of *P. insulata* collected from *C. odorata* in Jamaica and Cuba, in a paper presented at this congress.

REFERENCES

- Braimah H and Timbilla JA (2000). A decade of successful biological control of the Siam weed, *Chromolaena odorata*, in Ghana: lessons and future plans. Proceedings of the Fifth International Workshop on Biological Control and Management of *Chromolaena odorata*. 23-25 October, Durban, South Africa.
- Conlong DE (2000). Release and impact of *Pareuchaetes aurata* (Butler) (Lepidoptera: Arctiidae) on populations of *Chromolaena odorata* in KwaZulu-Natal, South Africa. Proceedings of the Fifth International Workshop on Biological Control and Management of *Chromolaena odorata*. 23-25 October, Durban, South Africa.
- Conlong DE and Way M (2000). Mass rearing of *Pareuchaetes aurata* (Butler) (Lepidoptera: Arctiidae). Proceedings of the Fifth International Workshop on Biological Control and Management of *Chromolaena odorata*. 23-25 October, Durban, South Africa.
- Kluge RL and Caldwell PM (1996). Failure and frustration of biocontrol of *Chromolaena odorata* in South Africa. pp 169-173 In: UK Prasad, R Muniappen, P Ferrar, JP Aeschliman and H. De Foresta (Eds). Proceedings of the Third International Workshop on Biological Control and Management of *Chromolaena odorata*. Agricultural Experiment Station, University of Guam.
- Parasram W, Zachariades C, Conlong DE and Byrne M (2000). Climate matching and prospects of control of *Chromolaena odorata* with *Pareuchaetes insulata* in KwaZulu-Natal. Proceedings of the 13th Congress of the Entomological Society of Southern Africa, Pietermaritzburg, South Africa.
- Strathie-Korrûbel LW and Zachariades C (2000). Biological control of *Chromolaena odorata* in South Africa: developments in research and implementation. Proceedings of the Fifth International Workshop on Biological Control and Management of *Chromolaena odorata*. 23-25 October, Durban, South Africa.
- Walton A and Conlong DE (2003). Laboratory rearing of *Pareuchaetes insulata* Walker (Lepidoptera: Arctiidae), a biological control agent of *Chromolaena odorata* (L.) King and Robinson (Asteraceae). *Proc S Afr Sug Technol Ass* 77 (in press).
- Zachariades C (2003). Biotypes of *Chromolaena odorata*, and their relevance to biocontrol of *Chromolaena odorata* in KwaZulu-Natal. *Proc S Afr Sug Technol Ass* 77 (in press).
- Zachariades C, Strathie-Korrûbel LW and Kluge RL (1999). The South African programme on the biological control of *Chromolaena odorata* (L.) King & Robinson (Asteraceae) using insects. *African Entomology Memoir* 1: 89-102.