

2000 Presentation Abstracts

A Survey in South Africa for Insects with Potential as Biological Control Agents for Cape Ivy (*Delairea Odorata* Lemaire)

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Introduction

Cape ivy, *Delairea odorata* Lemaire (Asteraceae), formerly *Senecio mikanioides* Otto ex Harv. is now one of the most invasive weeds in California, and also known to be invasive in Australia, New Zealand, Hawaii and Spain. Indigenous to Lesotho and the following provinces in South Africa: Western Cape, Eastern Cape, Mpumalanga, and KwaZulu-Natal, Cape ivy populations there are localized and show no invasive tendencies. In southern Africa, Cape ivy is both a creeper and climber on the fringes of indigenous forests, often on the southern slopes of mountainsides and hills.

In its native home, Cape ivy is an uncommon plant, and the insects associated with it have never been studied. Between April 1998 and April 1999, we conducted the first survey for phytophagous insects on Cape ivy. After locating Cape ivy, we obtained permission from the land owners to collect it. Since most of the sites were on public lands, this entailed obtaining numerous permits from the appropriate agencies [see Acknowledgements section]. Our survey covered most of this vine's geographic distribution in South Africa, as well as its various seasonal growth forms. Collecting included visual inspection, hand picking, beating and sweeping techniques, followed by the rearing of immature insects. Specimens were identified by appropriate specialists in South Africa, as well as in other countries [see Acknowledgements section].

Our results revealed a large insect fauna of over 120 families in 12 orders, comprising more than 400 species, either directly or indirectly associated with *D. odorata*. Phytophagous guilds causing the most damage comprised leaf-feeders (Coleoptera, Diptera, Lepidoptera, Thysanoptera), stem-borers (Diptera,

Lepidoptera), gall-formers (Diptera), leaf-rollers and leaf-tiers (Diptera, Lepidoptera), flower- and seed-feeders (Coleoptera, Diptera, Lepidoptera) and sap-suckers (Hemiptera).

After completing the first year's of surveys, between April 1999 and April 2000, we conducted another extensive survey, this time collecting not only from Cape ivy, but also from 12 species of carefully selected, closely-related and ecologically homologous plants growing in the vicinity. These included members of the genera *Senecio* (8 species), *Cineraria* (2 species), *Mikaniopsis* (1 species) and *Mikania* (1 species). All are climbers or sprawling plants, usually with at least semi-succulent leaves or stems, occurring in or on the edges of forest patches where Cape ivy also occurs. The objective of this second survey was to see if five of the insect natural enemies of Cape ivy, considered to have the highest potential as possible biological control agents, were restricted to Cape ivy under natural field conditions, or if some of them fed on any of the above mentioned relatives of Cape ivy as well.

Phytophages associated with Cape ivy

The following two tables list the phytophagous and presumably phytophagous insects associated with Cape ivy that we found during two years of surveys. Table One lists the insect species that we feel may be useful as potential biological control candidates have been marked ("***"). A variety of other diverse insects, damaging the plant but which are known, or likely, to have a variety of other hosts, are not marked. Very rare species, even if host specific to Cape ivy, are likely to prove extremely difficult to develop as biological control agents. Thus, some insect species found only in low numbers, such as some of the stem-boring

species and a root-feeder, have not been marked as possible biological control agents. Parasitoids, emerging from promising biological control agents, are included on our list, as the degree of parasitism may affect the eventual choice of an agent. Most of the parasitoids were wasps in the families Eulophidae, Braconidae and Ichneumonidae, and members of the latter two have only been identified to family level.

Table 1. List of potential biological control agents for Cape ivy collected during our surveys (1998-2000)

i) Gall-formers

Diptera

* **Tephritidae:** (Fruit flies)

* *Parafreutreta regalis* Munro

(Year 1: 33 adults, 13 maggots, 5 galls, 4 puparia, 21 collections at 16 sites)

(Year 2: 35 adults, more than 2 maggots, 12 collections at 7 sites)

* The galls formed by this fly appear to stunt growth of young shoots, and may also act as nutrient sinks.

Possible parasitoids of *P. regalis*, which emerged from galls collected in the field, include: Braconidae; Pteromalidae (cf. *Trichomalopsis* sp., nr. *Sphigigaster* sp., *Pteromalus* sp.); and Eurytomidae (*Eurytoma* sp.).

ii) Leaf-feeders

a) Coleoptera

* **Chrysomelidae:**

* cf. *Abrarius* species 1 indet. (Alticinae (Flea beetles)) (5 adults, possibly 4 larvae, 1 collection at 1 site)

* *Sphaeroderma* sp. (Alticinae) (15 larvae, 1 collection at 1 site)

* During the first year of surveying, larval leaf mines destroying most of the leaf blade were found on Cape ivy. Despite attempts to rear larvae in the laboratory, no adults were obtained. It was speculated that they may be the larvae of a cf. *Abrarius* sp. Leaf-mining larvae were also found during the second year of surveying. Similar larvae were observed in the leaves of *Senecio deltoideus*. Attempts made to rear the latter were successful. The adult is a small spherical alticine that also

feeds on the leaves, removing the lower leaf surface create a lace-like pattern.

* cf. *Ageniosa* sp. (Chrysomelinae) (6 adults, 1 larva, 1 collection at 1 site)

* Many larvae were collected feeding on the leaves of Cape ivy but only a few were reared to maturity during the second year of surveying. Final instar larvae pupated in loose soil from which the adults emerged.

* *Ageniosa* cf. *badenii* (Vogel) (Chrysomelinae)

* Adults and larvae of this species were collected from *D. odorata* plants in the Ngele Forest (a site we visited briefly during winter of the first year of surveying) by C. A. Rolando. She was a MSc student at the Botany Department of the University of Natal, Pietermaritzburg, in 1999, working on the breeding system and natural predators of *D. odorata*.

* Genus et species 1 indet. (Galerucinae)

(Year 1: 80 adults, 7 collections at 6 sites)

(Year 2: 26 adults, 2 collections at 2 sites)

* Adult beetles feed voraciously on leaves and the larvae may be shown to be root-feeders. Adults of this species were found only at two localities during the second year of surveying, in late November and early December. Significant damage to leaves was observed in the field.

* Genus et species 2 indet. (Galerucinae) (80 adult specimens collected, 6 collections at 6 sites)

* As for species 1 above.

b) Diptera

Agromyzidae:

* Genus et species 3 indet.

(Year 1: 5 adults, 1 puparium, 1 pupal case specimens collected, 5 collections at 3 sites)

(Year 2: 1 adult, 1 collection, 1 site)

* Larvae mine extensively in the leaves.

Possible parasitoids: Eulophidae (*Meruana* sp., *Chrysocharis* sp., *Chrysonotomyia* sp.).

c) Lepidoptera

* **Arctiidae:**

* *Diota rostrata* (Wallengren) (Arctiinae)

(Year 1: 116 adults and many more than 12 larvae, 16 collections at 13 sites)

(Year 2: 25 adults, 1 pupa, 7 collections, 6 sites)

- * A widespread and relatively common, hairy caterpillar which effectively defoliates plants. Possible parasitoids: Braconidae; Ichneumonidae; Tachinidae (*Carcelia* sp., *Linnaemya* sp., Genus et species 3 indet.).

iii) Leaf-rollers

Diptera

- * **Cecidomyiidae:** (Gall midges)
- * Genus et species 1 indet. (16 adults, more than 110 maggots, 1 pupa, 3 pupal cases, 27 collections at 22 sites)
- * Cecidomyiidae maggots cause leaf-curling and stunt growth.

iv) Root-feeders

Coleoptera

Curculionidae:

One larva was found amongst stems of *D. odorata* in the leaf litter layer, the specimen was not preserved and this finding could not be confirmed by subsequent findings.

v) Stem-borers

a) Diptera

- * **Agromyzidae:**
- * Genus et species 1 indet.
 - (Year 1: 247 adults, more than 5 pupae, 2 pupal cases, more than 2 maggots, 32 collections at 25 sites)
 - (Year 2: 97 adults, 1 maggot, few puparia, 19 collections, 10 sites)
- * Stem-boring fly maggots. Young emergent stems with a few leaves were collected although they appeared very healthy in the field. Flies emerged, indicating that there was obviously sufficient food and moisture for even very young maggots to develop to maturity. Possible parasitoids include: Pteromalidae (*Sphegigaster* species 1 and 2 indet.) and Braconidae.

b) Lepidoptera

- * **Acrolepidae:**
- * *Acrolepia* sp.
 - (Year 1: 260 adults, 4 cocoons, 4 pupae, 29 larvae, 32 collections at 26 sites)

(Year 2: 81 adults, 7 larvae, number of pupal cases and cocoons, 23 collections, 13 sites)

- * Potentially a very destructive moth species, which can cause the death of flowering and prostrate stems and damage leaves. During the second year of surveying very young emergent shoots with some leaves, were collected. Although the material appeared very healthy in the field, moths emerged. As these young stems contain much moisture, there was obviously sufficient food for even very young larvae to develop to maturity. A larva was also found mining extensively in a leaf. Possible parasitoids: Ichneumonidae and Braconidae.

vi) Flower- and seed-feeders

a) Coleoptera

- * **Melyridae:** (Soft-winged flower beetles)
- * *Pagurodactylus* cf. *rostralis* Champion (Dasytinae) (107 adults and many larvae, 9 collections at 9 sites)
- * *Pagurodactylus* species 1 to 4 indet. (Dasytinae) (12 adults and a number of larvae, 8 collections at 8 sites)
- * *Melyris* cf. *interstitialis* Champion (Melyrinae) (22 adults and more than 7 larvae, 6 collections at 6 sites)
- * *Melyris* species 2 indet. (Melyrinae) (81 adults and more than 14 larvae, 5 collections at 5 sites)
- * A variety of beetle larvae were found developing in unripe seeds in flower-heads and may be of use should inhibition of seeding be required. It was noted in the report after the first year of surveying that larvae had yet to be reared to confirm their specific identity. The larvae listed above were presumed to be those of the *Parurodactylus* and *Melyris* species, as they resembled larval morphology in the family Melyridae and large numbers of adult beetles were also found at the same sites. During the second year of surveying some of these larvae burrowed into soil, from which adult Phalacridae later emerged. Larvae listed above may therefore not all belong to the genera *Parurodactylus* and *Melyris* but also to the family Phalacridae. Therefore, adult phalacrid beetles collected have also been included in this section

- * **Phalacridae:** (Shining flower beetles)
 - * Genus et species 1 to 4 indet. (55 adults, 16 collections at 15 sites)
 - * Phalacridae are known to develop in flower heads of Asteraceae and some coleopterists regard them as specialised seed-eaters. See comments above under Melyridae.

b) Diptera

- * **Cecidomyiidae:** (Gall midges)
 - * Genus et species 3 indet. (4 adults and many maggots, 8 collections at 8 sites)
 - * A variety of midge maggots were found developing in unripe seeds in flower-heads and may be of use should inhibition of seeding be required.

c) Lepidoptera

Geometridae:

- Chloroclystis muscosa tumefacta* Prout (Larentiinae) (4 adults, 4 collections at 4 sites)
Eupithecia hypophasma Prout (Larentiinae) Prout (5 adults, 4 collections at 4 sites)
Eupithecia infelix Prout (Larentiinae) (2 adults, 2 collections at 2 sites)

Table 2. List of other phytophagous and presumably phytophagous insects that probably have little potential as biological control agents for Cape ivy

i) Flower- and seed-feeders

a) Coleoptera

Anthribidae:

- Urodontus planicollis* Louw (Urodontinae) (2 adults, 2 collections at 2 sites)

Bruchidae: (Seed and bean weevils)

- Spermophagus* sp. (Amblycerinae) (2 adults, 1 collection at 1 site)

Curculionidae: (Weevils)

- Derelomus* species (Curculioninae, Derelomini) (8 adults, 4 collections at 4 sites)
Mecysolobus species (Curculioninae, Molytini) (1 adult, 1 collection at 1 site)
Sibinia species 1 to 3 indet. (Curculioninae, Tychiini) (3 adults, 3 collections at 3 sites)

b) Diptera

Tephritidae: (Fruit flies)

- Cryptophorellia peringueyi* (Bezzi) (3 adults, 2 collections at 2 sites)
Telaletes ochracea (Loew) (10 adults, 2 collections at 2 sites)

c) Hemiptera

Lygaeidae:

- Dieuches expandens* Eyles (1 adult, 1 collection at 1 site)
 Probably *Dieuches* sp. nymphs (4 nymphs, 2 collections at 2 sites)
Nysius binotatus (Germar) (27 adults, more than 4 nymphs, 6 collections at 5 sites)
Nysius natalensis Evans (22 adults, 9 collections at 9 sites)
Nysius pallidus Evans (114 adults, 8 collections at 7 sites)
Nysius stali Evans (22 adults, 7 collections at 7 sites)

d) Thysanoptera

Phlaeothripidae:

- Haplothrips gowdeyi* (Franklin) (1 flower sample, 1 collection at 1 sites)
Haplothrips nigricornis (Bagnall) (4 flower samples, 4 collections at 4 sites)
Haplothrips species 3 indet. (1 flower sample, 1 collection at 1 site)

Thripidae:

- Thrips tenellus* Trybom (6 flower samples, 6 collections at 6 sites)

ii) Leaf-feeders

a) Coleoptera

Attelabidae:

- Probably *Auletobius* species (Rhynchitinae, Auletini) (1 adult, 1 collection at 1 site)

Brentidae:

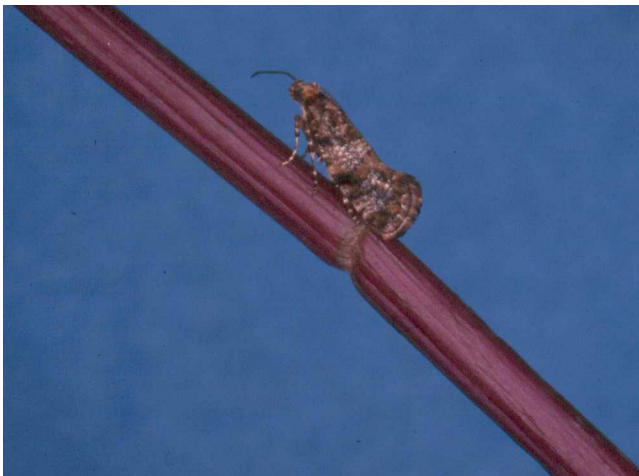
- Apion* species 1 indet. (Apioninae, Apionini) (1 adult, 1 collection at 1 site)
Apion species 2 indet. (Apioninae, Apionini) (4 adults collected, 1 collection at 1 site)
 cf. *Conapion* species 1 indet. (1 adult, 1 collections at 1 site)
 cf. *Piezotrachelus* species 1 indet. or *Conapion* species 1 indet. (1 adult, 1 collection at 1 site)
 cf. *Piezotrachelus* species 2 indet. or *Conapion* species 2 indet. (1 adult, 1 collection at 1 site)



Acrolepia larva



Acrolepia damage



Acrolepia live



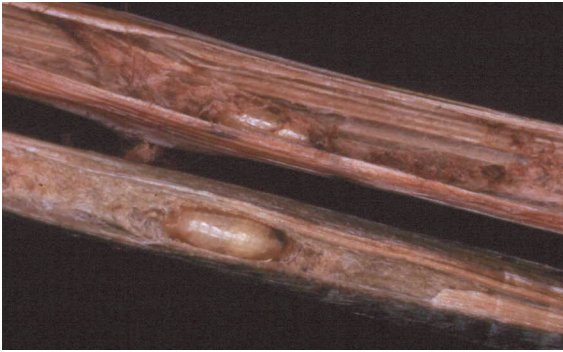
Acrolepia mines



Acrolepia pinned



Agromyzidae adult



Agromyzidae puparium



Diota larvae



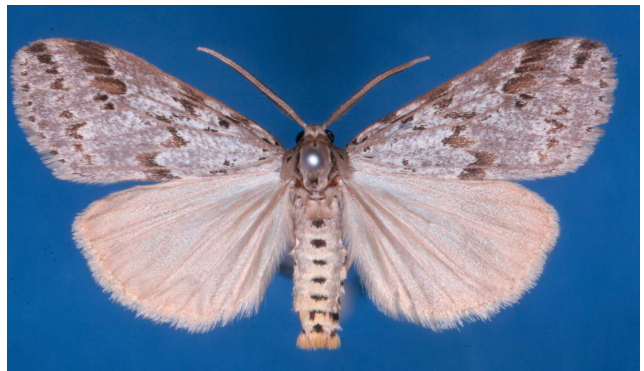
Diota adult live



Diota larva full



Diota female



Diota male



DODO fly & gall



Luperodes adult



DODO gall



Luperodes adult



Luperodes damage

cf. *Piezotrachelus* species 3 indet. or cf. *Conapion* species 3 indet. (1 adult, 1 collection at 1 site)

Chrysomelidae:

Afrorestia acuminata (Jacoby) (Alticinae (Flea beetles)) (3 adults, 3 collections at 3 sites)
Altica species 1 indet. (Alticinae) (4 adults, 2 collections at 2 sites)
Epitrix sp. cf. *integricollis* Jacoby (Alticinae) (7 adults, 1 collecting at 1 site)
Epitrix species 2 indet. (Alticinae) (1 adult, 1 collection at 1 site)
Hespera intermedia Jacoby (Alticinae) (1 adult, 1 collection at 1 site)
Longitarsus basutoensis Bechyné (Alticinae) (6 adults, 5 collections at 4 sites)
Longitarsus species 2 indet. (Alticinae) (1 adult, 1 collection at 1 site)
Podagratica oneili (Jacoby) (Alticinae) (1 adult, 1 collection at 1 site)
 Genus et species 10 indet. (Alticinae) (1 adult, 1



Luperodes feeding

collection at 1 sites)
Aspidimorpha confinis (Klug) (Cassidinae (Tortoise beetles)) (1 adult, 1 pupal case, 1 collection at 1 sites)
Aspidimorpha tecta Boheman (Cassidinae) (8 adults, 3 collections at 3 sites)
Cassida dorsovittata Boheman (Cassidinae) (8 adults, 3 collections at 3 sites)
Cassida lacrymosa Boheman (Cassidinae) (1 adult, 1 collection at 1 site)
Cassida litigiosa Boheman (Cassidinae) (6 adults, 3 collections at 3 sites)
Cassida melanophthalma Boheman (Cassidinae) (2 adults, 1 collection at 1 sites)
Lacoptera ruginosa Boheman (Cassidinae) (1 adult, 1 collection at 1 site)
 Genus et species 8 indet. (Cassidinae) (1 pupa, 1 collection at 1 site)
 Genus et species 1 indet. (Chlamysinae/Cryptocephalinae) (many case-bearing larvae, 1 collection at 1 site)
 Genus et species 1 indet. (Chrysomelinae) (2 adults, 2 collections at 1 site)
Cryptocephalus characterus Suffrian (Cryptocephalinae) (2 adult, 1 larval and 1 pupal case, 2 collections at 2 sites)
Cryptocephalus species 2 indet. (Cryptocephalinae) (1 adult, 1 collection at 1 site)
Colasposoma sp. (Eumolpinae) (1 adult, 1 collection at 1 site)
Macrocoma sp. (Eumolpinae) (1 adult, 1 collection at 1 site)
Scelodonta sp. (Eumolpinae) (3 adults, 2 collec-

tions at 2 sites)

Genus et species 4 indet. (Eumolpinae) (1 adult, 1 collection at 1 site)

Curculionidae: (Weevils)

Embrithes cirricollis (Boheman) (Brachycerinae, Embrithini) (1 adult, 1 collection at 1 site)

cf. *Lalagetes* species (Brachycerinae, Embrithini) (1 adult, 1 collection at 1 site)

Sciobius bistrigicollis Boheman (Brachycerinae, Otiorhynchini) (5 adults, 2 collections at 2 sites)

Sciobius pullus (Sparrman) (Brachycerinae, Otiorhynchini) (1 adult, 1 collection at 1 site)

Sciobius tottus (Sparrman) (Brachycerinae, Otiorhynchini) (2 adults, 1 collection at 1 site)

Sciobius species 4 indet. (Brachycerinae, Otiorhynchini) (1 adult, 1 collection at 1 site)

Sciobius species 5 indet. (Brachycerinae, Otiorhynchini) (3 adults, 1 collection at 1 site)

Sciobius species 6 indet. (Brachycerinae, Otiorhynchini) (1 adult, 1 collection at 1 site)

Sitona discoideus Gyllenhal (Brachycerinae, Sitonini) (1 adult, 1 collection at 1 site)

Tanymecus probably *makkaliensis* Fåhræus (Brachycerinae, Tanymecini) (1 adult, 1 collection at 1 site)

Eremnus probably new species, near *Eremnus horticola* Marshall (Brachycerinae, Tanyrhynchini) (6 adults, 3 collections at 3 sites)

Eremnus segnis Marshall or species near (Brachycerinae, Tanyrhynchini) (14 adults, 2 collections at 2 sites)

Eremnus probably new species, near *E. murinus* Boheman (Brachycerinae, Tanyrhynchini) (5 adults, 2 collections at 2 sites)

Eremnus aciculaticollis Boheman or species near, #1 (Brachycerinae, Tanyrhynchini) (5 adults, 2 collections at 2 sites)

Eremnus aciculaticollis Boheman or species near, #2 (Brachycerinae, Tanyrhynchini) (2 adults, 1 collection at 1 site)

Baris species (Curculioninae, Baridini) (2 adults, 1 collection at 1 site)

Genus et species 1 indet. (probably *Ceutorhynchus* sp.) (Curculioninae, Ceutorhynchini) (12 adults, 6 collections at 5 sites)

Genus et species 2 indet. (Curculioninae, Ceutorhynchini) (1 adult, 1 collection at 1 site)

Genus et species 3 indet. (Curculioninae, Ceutorhynchini) (1 adult, 1 collection at 1 site)

b) Lepidoptera

Arctiidae:

Galtara purata Walker (2 adults and 2 larvae, 3 collections at 3 sites)

Geometridae: (Loopers).

Oedicentra albipennis Warren (Ennominae) (1 adult, 1 collection at 1 site)

Comostolopsis stillata (Felder & Rogenhofer) (Geometrinae) (1 adult, 1 collection at 1 site)

Eupithecia infelix Prout (Larentiinae) (5 adults, 4 collections at 4 sites)

Eupithecia nigrbasis (Warren) (Larentiinae) (1 adult, 1 collection at 1 site)

Possible parasitoids: Braconidae.

Lasiocampidae:

Bombycopsis cf. *bipars* (Walker, 1855) (Lasiocampinae) (1 adult, 1 collection at 1 site)

Probably *Bombycopsis* cf. *bipars* (Walker, 1855) (Lasiocampinae) (1 larva, 1 collection at 1 site)

Noctuidae:

Agrapha limbirena (Gueneé) (Plusiinae) (5 adults, 4 collections at 4 sites)

Possible parasitoid: Encyrtidae (*Copidosoma* sp.)

Trichoplusia orichalcea (Fabricius) (Plusiinae) (1 adult, 1 collection at 1 site)

Psychidae:

Genus et species indet. (Psychinae) (1 adult, 1 collection at 1 site)

Pyralidae:

Larva, genus et species indet. (1 larva, 1 collection at 1 site)

cf. *Ancylosis* (*Heterographis*) sp. (Phycitinae) (1 adult, 1 collection at 1 site)

Udea ferrugalis (Hübner) (Pyraustinae) (23 adults, 13 collections at 12 sites)

Tortricidae:

Lobesia (Polychrosis) stericta (Meyrick) (Olethreutinae) (3 adults, 2 collections at 2 sites)

cf. *Cydia* species (Olethreutinae) (1 adult, 1 collection at 1 site)

Similar to '*Epichorista*' *perversa* Meyrick (Species 2 indet.) (Tortricinae) (15 adults, 1 pupa, 1 larva, 10 collections at 9 sites)

Probably near *Procraca* or *Niphothixa* (Species 1 indet.) (Tortricinae) (17 adults, 8 collections at 8 sites)

Possible parasitoids: Braconidae & Ichneumonidae.

c) **Orthoptera**

Caelifera:

Acrididae: (Grasshoppers, locusts)

Genus et species 1 indet. (16 nymphs, 1 collection at 1 site)

Genus et species 2 indet. (14 nymphs, 3 collections at 3 sites)

Genus et species 3 indet. (1 nymph, 1 collection at 1 site)

Genus et species 4 indet. (1 nymph, 1 collection at 1 site)

Genus et species 5 indet. (3 nymphs, 3 collections at 3 sites)

Genus et species 6 indet. (large number of nymphs, 1 collection at 1 site)

Tetrigidae: ('grouse-locusts' 'pygmy grasshoppers')

Genus et species indet. (1 adult, 1 collection at 1 site)

Ensifera: (Crickets, bush crickets, katydids)

Gryllidae: (Crickets)

Genus et species indet. (1 adult, 2 nymphs, 1 collection at 1 site)

Tettigoniidae: (katydids, bush crickets, long-horned grasshoppers)

Genus et species indet. (2 nymphs, 2 collections at 2 sites)

d) **Thysanoptera**

Thripidae:

Anaphothrips cf. *tamaricis* (Priesner) (1 sample, 1 collection at 1 site)

Frankliniella occidentalis (Pergande) (2 samples, 2 collections at 2 sites)

Heliothrips haemorrhoidalis (Bouché) (1 sample, 1 collection at 1 site)

Heliothrips sylvanus Faure (1 sample, 1 collection at 1 site)

Hercinothrips bicinctus (Bagnall) (4 samples including 15 adults, 4 collections at 3 sites)

Hercinothrips jansei Faure (1 sample, 1 collection at 1 site)

Hercinothrips cf. *jansei* Faure (2 adults and 1 larva, 1 collection at 1 site)

Scirtothrips aurtantii Faure (2 samples, 2 collections at 2 sites)

Taeniothrips gowdeyi Bagnall (5 samples, 5 collections at 5 sites)

Thrips tabaci Lindeman (2 samples, 2 collections at 2 sites)

Thrips (Athrips) brevisetosus Trybom (3 samples, 3 collections at 3 sites)

Thrips sp. (5 samples including 8 adults and larvae, 5 collections at 5 sites)

ii) **Root-feeders**

Coleoptera

Chrysomelidae:

Larvae of the Eumolpinae are probably root feeders.

Colasposoma sp. (Eumolpinae) (1 adult, 1 collection at 1 site)

Macrocoma sp. (Eumolpinae) (1 adult, 1 collection at 1 site)

Scelodonta sp. (Eumolpinae) (3 adults, 2 collections at 2 sites)

Genus et species 4 indet. (Eumolpinae) (1 adult, 1 collecting at 1 site)

iii) **Sap-suckers**

Hemiptera

Auchenorrhyncha (Cicadas, spittle bugs, leafhoppers, planthoppers)

Acanaloniidae:

Genus et species indet. (25 adults, 7 nymphs, 7 collections at 7 sites)

Achilidae:

Genus et species 1 and 2 indet. (2 adults, 2 collections at 2 sites)

Aphrophoridae:

Poophilus sp. (31 adults and 26 nymphs, 17 collections at 16 sites)

Cercopidae: (Spittle bugs)

Locris sanguinipes Walker (8 adults, 2 collections at 2 sites)

Sepulia sp. (2 adults, 1 collections at 1 sites)

Cicadellidae: (Leafhoppers)

Napotrephes africanus Stål (Agalliinae) (1 adult, 1 collection at 1 site)

cf. *Peragallia* sp. (Agalliinae) (10 adults, 1 nymph, 5 collections at 4 sites)

Mileewa adrastus Linnavuori (Cicadellinae) (1 adult, 1 collection at 1 site)

Mileewa signoreti (Stål) (Cicadellinae) (1 adult, 1 collection at 1 site)

Mileewa sp. (Cicadellinae) (1 adult, 1 collection at 1 site)

Poecilocarda minuscula Linnavuori (Cicadellinae) (2 adults, 2 collections at 1 site)
Equefa tsitsi Theron (Deltocephalinae) (1 adult, 1 collection at 1 site)
Afrosteles distans (Linnavuori) (Deltocephalinae) (number of adults and nymphs, 2 collections at 2 sites)
Afrosus unimaculatus (Naudé) (Deltocephalinae) (1 adult, 1 collection at 1 site)
Balclutha sp. (Deltocephalinae) (1 adult, 1 collection at 1 site)
Exitianus capicola (Stål) (Deltocephalinae) (1 adult, 1 collection at 1 site)
Nesoclutha erythrocephala (Ferrari) (Deltocephalinae) (2 adults, 2 collections at 2 sites)
Recilia sp. (Deltocephalinae) (4 adults, 2 collections at 2 sites)
Tetartostylus brevistylus Theron (Deltocephalinae) (1 adult, 1 collection at 1 site)
 Genus et species 8 indet. (Deltocephalinae) (3 adults, 5 nymphs, 3 collections at 3 sites)
Iassomorpha drakensteini (Naudé) (Iassininae) (1 adult, 1 collection at 1 site)
Narecho tecomariae Theron (Nirvaninae) (2 adults, 2 collections at 2 sites)
Penthimiola bella (Stål) (Penthimiinae) (5 adults, 1 nymph, 1 collection at 1 site)
 Genus et species 1 indet. (Selenocephalinae) (1 adult, 1 collection at 1 site)
 Genus et species 2 indet. (Selenocephalinae) (2 adults, 2 collections at 2 sites)
 Genus et species 3 indet. (Selenocephalinae, Ianeirini) (many more than 14 adults, many more than 10 nymphs, 9 collections at 8 sites)
Accacidia sp. (Typhlocybinae) (4 adults, 1 collection at 1 site)
Empoasca barbistyla Poali (Typhlocybinae) (many more than 27 adults, many more than 5 nymphs, 13 collections at 12 sites)
Epignoma natalensis Dworakowska (Typhlocybinae) (many more than 26 adults, many nymphs, 11 collections at 9 sites)
Tzitzikamaia sp. (Typhlocybinae) (1 adult, 1 collection at 1 site)
 Genus et species 5 to 8 indet. (Typhlocybinae) (many more than 10 adults, many nymphs, 7 collections at 7 sites)
 Nymphs, genus et species indet. (Typhlocybinae) (3 nymphs, 1 collection at 1 site)

Coloborrhhis corticina Germar (Ulopinae) (2 adults, 1 collection at 1 site)

Cixiidae:

Achaemenes entabeniensis Synave (1 adult, 1 collection at 1 site)

Delphacidae:

Embolophora britmusei Asche (1 adult, 1 collection at 1 site)

Sogatella vibix (Haupt) (2 adults, 1 collection at 1 site)

Sogatella sp. (1 adult, 1 collection at 1 site)

Thriamus sp. (1 adult, 1 collection at 1 site)

Dictyopharidae:

Genus et species indet. (1 nymph, 1 collection at 1 site)

Flatidae:

Dalapax postica (Spinola) (7 adults, 3 collections at 3 sites)

Issidae:

Genus et species indet. (8 adults, 6 collections at 6 sites)

Membracidae: (Treehoppers)

Nymphs, genus et species indet. (3 nymphs, 2 collections at 2 sites)

Tettigometridae:

Hilda patruelis (Stål) (1 adult, 1 collection at 1 site)

Hemiptera: Heteroptera

Coreidae: (Squash bugs)

Cletus sp. (1 adult, 1 collection at 1 site)

Coreidae nymphs, genus et species indet. (2 nymphs, 2 collections at 2 sites)

Lygaeidae:

Caenocoris nerii (Germar) (1 adult, 1 collection at 1 site)

Lasiosomus enervis (Herrich-Schaeffer) (14 adults, 8 collections at 8 sites)

Oncopeltus famelicus (Fabricius) (1 adult, 1 collection at 1 site)

Miridae:

Genus et species 1 indet. (47 adults, 5 nymphs, 13 collections at 12 sites)

Genus et species 2 indet. (5 adults, 5 collections at 5 sites)

Genus et species 3 indet. (3 adults, 2 collections at 2 sites)

Genus et species 4 indet. (3 adults, 2 collections at 2 sites)

Genus et species 5 indet. (1 adult, 1 collection at 1 site)

site)

Genus et species 6 indet. (3 adult, 2 collections at 2 sites)

Genus et species 7 indet. (9 adults, 8 nymphs, 7 collections at 6 sites)

Genus et species 8 indet. (1 adult, 1 collection at 1 site)

Pentatomidae: (Shield bugs).

Bagrada hilaris Burmeister (1 adult, 1 collection at 1 site)

Boerias maculata Distant (3 adults, 2 collections at 2 sites)

Carbula sp. (1 adult, 1 collection at 1 site)

Caura rufiventris Germar (1 adult, 1 collection at 1 site)

Eysarcoris inconspicuus Herrich-Schaeffer (3 adults, 2 collections at 2 sites)

Halydicoris sp. (1 adult, 1 collection at 1 site)

Nezara prunasis Dallas (1 adult, 1 collection at 1 site)

Nezara viridula (Linnaeus) (5 adults, 5 collections at 5 sites)

Genus et species indet. (4 nymphs, 4 collections at 4 sites)

Plataspidae:

Brachyplatys sp. (2 adults, 1 collection at 1 site)

Pyrrhocoridae: (Cotton stainers).

Cenaeus carnifex (Fabricius) (4 adults, 1 nymph, 2 collections at 2 sites)

Dermatinus sp. (4 adults, 3 collections at 3 sites)

Scantius sp. (1 adult, 1 collection at 1 site)

Rhopalidae:

Leptocoris sp. (2 adults, 3 nymphs, 2 collections at 1 site)

Tingidae: (Lace bugs).

Genus et species indet. (1 adult, 1 collection at 1 site)

Hemiptera: Sternorrhyncha

Aleyrodidae: (Whiteflies)

Aleyrodes proletella (Linnaeus) (Cabbage whitefly) (many adults and nymphs, 13 collections at 10 sites)

Possible parasitoids: Aphelinidae (*Encarsia* sp.)

Aphididae: (Aphids).

Aulacorthum circumflexum (Buckton) (Mottled Arum aphid) (sample with adults and nymphs, 1 collection at 1 site)

Brachycaudus helichrysi (Kaltenbach) (Leaf-curling plum aphid) (large sample, 1 collection at

1 site)

Macrosiphum euphorbiae (Thomas) (Potato aphid) (sample with adults and nymphs, 1 collection at 1 site)

Possible parasitoids: Braconidae (many genera et species indet.) and Braconidae: Aphidiinae.

Diaspididae: (Armoured scales).

Aspidiotus nerii Bouché (Oleander scale) (5 samples, 5 collections at 5 sites)

Genus et species indet. (2 samples, 2 collections at 2 sites)

Possible parasitoids: Aphelinidae (*Encarsia* sp., *Aphytis* sp.)

Margarodidae: (Giant coccids and ground pearls).

cf. *Icerya* sp. (1 nymph, 1 collection at 1 site)

Genus et species indet. (2 nymphs, 1 collection at 1 site)

Pseudococcidae: (Mealybugs).

Genus et species indet. (1 specimen, 1 collection at 1 site)

Psyllidae: (Jumping plant lice).

Genus et species indet. (3 adults, 2 collections at 2 sites)

v) Stem-borers

a) Coleoptera

Cerambycidae: (Long-horned beetles).

Promeces longipes Olivier (Cerambycinae) (3 adults, 2 collections at 2 sites)

Zosterius laetus Thomson (Cerambycinae) (3 adults, 1 collection at 1 site)

Sophronica sp. (Lamiinae) (1 adult, 1 collection at 1 site)

Chrysomelidae: (Leaf beetles).

Subfamily, genus et species indet. (stem-borer/gall former) (2 larvae, 2 collections at 2 sites)

Curculionidae:

Gasteroclisus species (Curculioninae, Lixini) (2 adults, 2 collections at 1 site)

Lixus species (Curculioninae, Lixini) (1 adult, 1 collection at 1 site)

Mecysolobus species (Curculioninae, Molytini) (1 adult, 1 collection at 1 site)

Genus et species 3 indet. (Curculioninae) (1 adult, 1 collection, at 1 site)

Genus et species. 1 to 4 indet. (Scolytinae) (5 adults, 4 collections at 4 sites)

Curculionidae of unknown affinity:

One weevil larva was collected from a "cell"

(possibly a gall) in a stem (1 site)
Stem-borers among the Curculionidae are mostly Molytini and Lixini of which a small number were collected during this survey. However, this larva seems to be too large for the species collected from these groups (pers. comm., R.G. Oberprieler). Rearing this larva to adulthood will allow identification.

Languriidae: (Lizard beetles)

Genus et species 1 to 2 indet. (4 adults, 2 collections at 2 sites)

b) Lepidoptera

Tineidae:

Ogona omoscopa (Meyrick) (1 adult, 1 collection, 1 site)

Conclusion following two years of surveying

Tests with potential biological control candidates, on alternative food plants under artificial conditions, are usually expensive and more so if done in quarantine in the new country. Results may be misleading and lead to unnecessary and premature rejection of good candidates. Information on the occurrence of such insects, on closely related and similar plants in their native habitat, could reduce the possibility of wasting time and resources on candidates that may later prove unacceptable. Conversely, proof of their absence on such plants but abundance on the targeted weed in the field, would support the notion of co-evolution with, or restriction to, one or a few closely-related plants, and possibly even host-specificity (monophagy). In practice these results could aid greatly in designing meaningful tests to be done under controlled conditions and with correct selection of test plants from the proposed new environment.

The second year of surveying in the field revealed significant data:

- ***Acrolepia* sp., the leaf- and stem-mining moth, was entirely restricted to Cape ivy.** Ecologically homologous moth species occurred on seven of the other 12 plant species.
- **Defoliating larvae of the moth *D. rostrata*, were found on only one other host in the field, namely *Senecio angulatus*.** This plant is also known to be a host where grown in gardens. Similar, ecologically homologous moth larvae were found on two of the other plants surveyed.
- ***Parafreutreta regalis*, the stem-galling fly, was**

only reared from Cape ivy. Ecologically homologous flies were reared from stem galls on five of the other plants surveyed.

- **Damage by adults of the of the unidentified leaf-feeding beetles, Chrysomelidae: Galerucinae, was found to be limited to Cape ivy,** also suggesting a restricted host range. The site for larval development on the plant still has to be determined for these beetles.
- **Maggots of flies in the family Agromyzidae were found to develop in stems of Cape ivy and of nine of the plant species studied.** Until identification, or at least expert comparison of the reared adult flies has been done, it is not possible to determine if one or more species of fly may be involved.

These results, exceptionally narrow host ranges amongst the likely alternative plants, suggest that further, more definitive work on at least four of the five insects previously selected, seems warranted. Also that some, if not all, may prove to be safe and most valuable for use as biological control agents in California and elsewhere.

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