Biological Control of Cape Ivy Project Reaches Milestone

Joe Balciunas

Since 1997, CalEPPC, in partnership with the California Native Plant Society (CNPS), has spearheaded a campaign to raise funds to assist a USDA-ARS project to develop biological control agents for Cape ivy, *Delairea odorata* (synonym, *Senecio mikanioides*). USDA-ARS does not receive sufficient funds from Congress to fully fund the research on Cape ivy, and we were unable to perform the necessary overseas research. In each of the past four years, CalEPPC and CNPS have been successful in raising $45,000-65,000 annually, which was then contributed to the Cape Ivy Project at the USDA quarantine in Albany, CA. As leader of this project, I then used the CalEPPC/CNPS contributions to contract research in South Africa, the native home of Cape ivy, to locate and develop potential biological control agents. I was fortunate enough to obtain the services of several talented South African scientists for this project. Each year, I provide a research plan to these cooperating scientists, then spend 4-5 weeks with them in South Africa, assisting in the research, reviewing their results, and jointly planning the research for the following year.

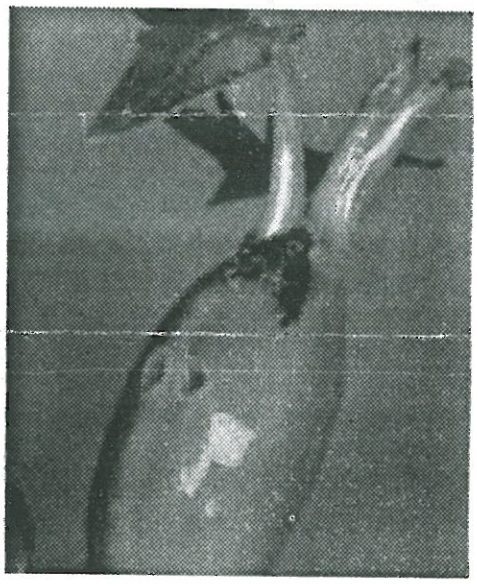
Year 3 of Cape ivy research in South Africa was completed in March 2001. During the first year, the South African team, led by Beth Grobbelaar, located Cape ivy populations throughout South Africa, and collected the natural enemies that attack it. This was not an easy task. In South Africa, Cape ivy is a very uncommon plant, and even expert botanists had never seen a plant in the wild. Nevertheless, our team was successful in locating Cape ivy at several dozen sites. Over 200 species of plant-injuring insects were collected on Cape ivy at these sites (see article in the CalEPPC 2000 Symposium Proceedings).

We selected the six most promising of these insects, and during the second year of research, tried to collect these six insects on relatives of Cape ivy growing at these sites. More than a dozen close relatives of Cape ivy were repeatedly examined, but only one of the six insects, an arctiid moth — *Diota rostrata*, was ever collected on anything but Cape ivy. Thus, it would appear that at least five insects are very host-specific to Cape ivy. These insects are likely to survive further intensive testing of their host range (the plants on which each insect species will feed and develop).

During the third year (2000-01), research in South Africa focused on learning more about the biology, safety, and impact of some of the most promising insects. This research phase was led by the eminent South African weed biocontrol specialist, Dr. Stefan Neser, and his assistant Liamé van der Westhuisen. Eventually, they established laboratory colonies of two Cape ivy insects: the stem-boring moth *Acrolepia* new species, and the gall-forming fly *Parafreutreta regalis*. Joanna Wing, a USDA-sponsored graduate student at Wits University in Johannesburg, has nearly completed her M.Sc. research, concentrating on the biology of the arctiid moth, *Diota rostrata*. And Beth Grobbelaar was able to temporarily maintain a colony of chrysomelid beetles that severely damage the leaves of Cape ivy – but this colony died out.

> . . . in South Africa Cape ivy is a very uncommon plant, and even expert botanists had never seen a plant in the wild. [!]

Dr. Neser made great progress in his studies of *Acrolepia* and *Parafreutreta*. I'm convinced that not only will these two insects prove host-specific enough to release, but that we now know enough about their biology to successfully rear them in our USDA quarantine in Albany, CA. Hence, I obtained the necessary import permits, and when I returned from South Africa on Jan. 9, 2001, I hand-carried both these insects back to our quarantine. As these are the first Cape ivy insects to be imported into the United States, they represent a significant milestone.



Parafreutreta adult on gall.

The stem-boring moth (*Acrolepia* n. sp.) was discovered during our surveys and appears to be new to science and never before described. It is, however, one of the most widely distributed of Cape ivy natural enemies, and we collected it at nearly all our Cape ivy sites in South Africa. This tiny moth (less than a inch

in length) lays eggs within the leaf of Cape ivy. Minute caterpillars hatch out and tunnel within the leaves, leaving a distinctive narrow "mines." Some of the caterpillars bore down through the leaf petiole, and then bore inside the stem of Cape ivy. In the lab, most of the mined leaves, and many of the bored stems die, and sometimes the entire Cape ivy plant is killed.

The gall fly, *Parafreutreta regalis*, is a fruit fly (family *Tephritidae*) that appears to specialize on Cape ivy. The female *Parafreutreta*, about the size of a large housefly, lays eggs inside the growing tip of Cape ivy. The little maggot that hatches out inside the tip convinces Cape ivy to grow a spherical structure, about a inch in diameter, within which the maggot completes its life cycle. These galls seem to inhibit further elongation of that stem, although side shoots are usually produced. The weight of the gall causes the stem to droop, and most galls are beneath a "mat" of Cape ivy. We theorize that "galled" Cape ivy plants will be less aggressive in clambering over native trees and shrubs.

With these first two Cape ivy insects in our quarantine, we will begin a lengthy investigation into their host specificity. We must be confident of the safety of any insect we seek to release to control Cape ivy. Several years of additional laboratory and field evaluations of their host range will be required. Then, if we still feel that the insect is safe, we will prepare a request for the release. Regulatory approval can easily take an year. Thus, it will probably be three to five more years before the first of these insects is released in California. In the meantime, we're assembling the test plants we will need for our host range tests. Many additional plant species are still needed (see accompanying article) and we hope that CalEPPC and CNPS members can assist us in obtaining some of those.

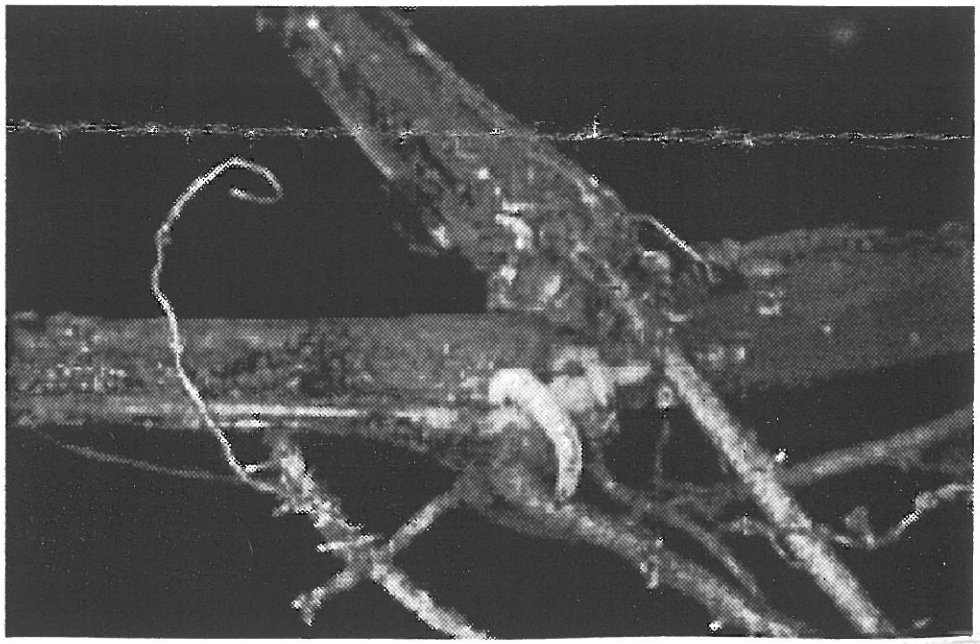
Test Plants Needed for Biocontrol of Cape Ivy Project

Joe Balciunas

We now have the first two candidates as possible biological control agents for Cape ivy in our quarantine containment facility in Albany, CA [see article this newsletter]. Prior to requesting release of these insects, we must first obtain compelling evidence that they are safe enough to release. We will do this primarily by evaluating the host range of each insect – the array of plant species that each insect will find acceptable for feeding and development.

Since herbivorous insects have close evolutionary ties to their host plant, we will concentrate our tests on the close relatives of Cape ivy, mainly the other members of the tribe *Senecioneae*, in the sunflower family *Asteraceae*. Here in Albany, we currently have only about a dozen of the 30-50 plant species that we are planning to evaluate [see Table for list of currently needed plants]. In order to speed up our evaluations, our South African colleagues will test these insects in parallel with us. However, they will concentrate on South African relatives of Cape ivy. We will test primarily California natives in the tribe *Senecioneae*, especially those growing along the coast, where they are most likely to be encountered by our insects, after they are released.

Any assistance in obtaining seeds and/or plants on this list will be greatly appreciated, and should help expedite the early release of these potential biological control agents for Cape ivy. Besides the various California *Senecio* species, we also need *Blennosperma, Cacaliopsis, Crocidium, Lepidospartum,* and *Tetradymia*. If necessary we will reimburse collectors for their expenses, or even meet them at the field site to assist in collecting the seeds/plants. Sites on private property are usually preferred, since obtaining the necessary permits to collect on public lands can be very time consuming. For further information please contact me at joe@pw.usda.gov or (510) 559-5975.



Acrolepia larvaeadult on

Senecioeae Species in California

* introduced species
• plants we desire for host-specificity testing
••some seedlings available, but more are required
Note: any other *Senecio* seeds would be welcome

Subtribe *Senecioninae*

	Genus	species	Where found (Jepson)
	Delairea	odorata*	Shady ± disturbed places; <200m. Nco, Cco, SnFrB
	Erechtites	glomerata*	Woods near coast; <500m. NCo, NCoRO, CCo, SCoRO
		hieracifolia*	Disturbed sites near coast; <500m. NCo, n CCo
		minima*	Grassland, woodland, coastal scrub; gen <500m. NCo, NCoRO, CCo, SCoRO
•	Senecio	aphanactis	Drying alkaline flats; <400m. CW, SCo, Chl
		aronicoides	Dry open foothill woodland, montane forest; <2500m. NW, CaR, SN (exc Teh), n CW
•		astephanus	Steep rocky slopes; 400-1500m. s SCoRO, TR
		bernardinus	Pine forests; 1800-2300m. e SnBr
		blochmaniae	Sand dunes, coastal floodplains; <100m. s CCo
••		bolanderi	Wet cliffs, open forest; <200m. NCo
••		breweri	Seasonally damp, protected woodlands; 200-1700m. s SNF, Teh, e SnJV, c&s CW, n WTR
•		californicus	Coastal strand to shrubland; <1200m. s SN, Teh, CW, SW, w DSon
		canus	High rocky plains, sagebrush scrub; 1300-3600m. e KR, CaR, SN, GB
		clarkianus	Damp meadows; 1400-2700m. c&s SN
		clevelandii var. clevelandii	Drying serpentine soils, esp among shrubs; 400-900m. s NCoRI (Napa, Lake Cos.), c SNF (Tuolumne Co.)
		cymbalarioides	Damp alpine meadows; 17003500m. s CaRH, n&c SNH, MP
		elegans*	Disturbed coastal habitats; <100m. CCo, SnFrB, SCo
		eurycephalus var. lewisrosei	Serpentine slopes, canyons; 550-900m. n SNH (Feather River drainage, e Butte, Plumas Cos.)
		flaccidus	Dry, rocky or sandy sites; <2000m. CA-FP (exc NCo, KR), SNE, D
		fremontii	Talus, other rocky placesl 2600-3600m. CaRH, SN, SnBr, GB
••		ganderi	Chapparal, burns; 400-1200m. sw PR (sw San Diego Co.)
		greenei	Dry, open serpentine in scrub or; 400-1500m. s KR, NCoR
		hybridus*	Damp, protected, disturbed sites; <100m. SnFrB
		hydrophiloides	Damp meadows, hillsides; 1500-2800m. e CaRH, n SN, MP
•		hydrophilus	Swamps, muddy sites, tolerant of standing saltwater; <2300m. s NCoR, CaR, SN, deltaic GV, n CW, GB
		indecorus	Meadows, streambanks in open woods; 1600-2000m. s MP (pine Creek, Lassen Co.)
•		integerrimus	Grassland, open forest; 150-3600m. KR, NCoRI, CaR, SN (exc Teh), GB
		ionophyllus	Dry rocky coniferous forest, granite crevices; 1500-2700m. s SN, SnGb, SnBr
••		jacobaea*	Pastures, roadsides, disturbed places; <1500m. NCo, W KR, sw CaR, n SN, n ScV, SnFrB
•		layneae	Dry pine/oak woodland, on serpentine; 200-1000m. n SNF (El Dorado, Tuolumne Cos.)
•		lyonii	Hillsides; <500m. s Chl (Santa Catalina, San Clemente islands)
		macounii	Rocky, disturbed streamsides, roadsides, clearings in coniferous forest; 400-900m. nw KR (Del Norte Co.)
		mohavensis	Sandy washes, flats; <1000m. D
		multilobatus	Rocky or sandy soils, sagebrush or open woodland; 1400-3200m. SNH (e slope), SNE. DMtns
		pattersonensis	Talus slopes; 2900-3700m. c SNH, n SNE (Sweetwater Mtns.)
		pauciflorus	Subalpine or alpine meadows; 2400-3500m. SNH
		pseudaureus	Streambanks, meadows; 2400-3300m. CaRH, SN, Rrn
		scorzonella	Open forest, meadow edges; 1600-3500m. CaRH, SNH, n W&I
		serra	Damp, open coniferous forest or sagebrush scrub; 1300-3200m. s SNF, SNH (e slope)
		spartioides	Dry, open rocky places; 1800-3200m. SNH (e slope), SnBr, SNE, n DMtns
		streotanthifolius	Woodlands, rocky areas, to alpine barrens; 900-3100m. CaR, SNH, MP
		sylvaticus*	Open, disturbed woodland, rocky sites, ± coastal; <200m. NCo, n CCO, SnFrB
••		triangularis	Wet meadows, streambanks in open, coniferous forest; 100-3500m. KR, CaR, SN, SnGb, SnBr, PR, MP
		vulgaris*	Gardens, farmlands, other disturbed sites; <1500m. CA (exc D)
		werneriaefolius	Talus, open sites, among trees near timberline, in loose soil; 3000-4000m. n&c SNH, n W&I

Subtribe *Blennospermatinae*

•	Blennosperma	bakeri	Vernal pools, wet grasslands; <100m. NCoR, ne SnFrB (s Sonoma Co.)
•		nanum	Grassland, scrub, woods, gen wet, open areas; <1600m. NCoR, SNF, GV, CW, SCo, Chl
•	Crocidium	multicaule	Snady soils, grassland, open woodland; gen <1500m. NCoR, SNF, e SnFrB, SCoR (very uncommon), MP

Continued opposite page

Subtribe *Tussilaginaceae*

•	Cacaliopsis	nardosmia	Meadows, open forest, sometimes serpentine; 200-1900m. KR, NCoR
•	Lepidospartum	latisquanum	Sandy or gravelly pine/juniper woodlands, open scrubland; 1400-1500m. SnGb (n slope), W&I, DMtns
•		squamatum	Sandy or gravelly washes, stream terraces; <1800m. SNF, SCoRI, SW, D
••	Luina	hypoleuca	Rocky places, cliffs, sometimes on serpentine; <1200m. KR, NCoR, sw SnFrB
	Petasites	frigidus var. palmatus	Forests, gen wet soil; <400m. NW, nw&nc CW
•	Tetradymia	argyraea	Pinyon/juniper woodland; 1400-2100m. DMtns.
		axillaris	Sagebrush or saltbrush scrub; 1200-2300m. s SNE, DMoj
•		canescens	Sagebrush scrub, pinyon/juniper woodland, forest; (400) 1600-3300m. TR, s PR, GB, DMoj
•		comosa	Coastal scrub, chapparal, sagebrush scrub; 300-1500m. TR, PR
		glabrata	Sagebrush scrub, pinyon/juniper or Joshua-tree woodland; 800-2400m. GB; DMoj
		spinosa	Gen saltbrush scrub; 800-2400m. s MP, n SNE
		stenolepis	Joshua-tree woodland, creosote-bush scrub; 600-1500m. SNE, DMoj
		tetrameres	Dunes, deep sand, sagebrush scrub; 1200-2100m. n SNE

Subtribe *Senecioninae*

•	Senecio	aphanactis	Drying alkaline flats; <400m. CW, SCo, Chl
•		astephanus	Steep rocky slopes; 400-1500m. s SCoRO, TR
••		bolanderi	Wet cliffs, open forest; <200m. NCo
••		breweri	Seasonally damp, protected woodlands; 200-1700m. s SNF, Teh, e SnJV, c&s CW, n WTR
•		californicus	Coastal strand to shrubland; <1200m. s SN, Teh, CW, SW, w DSon
••		ganderi	Chapparal, burns; 400-1200m. sw PR (sw San Diego Co.)
•		hydrophilus	Swamps, muddy sites, tolerant of standing saltwater; <2300m. s NCoR, CaR, SN, deltaic GV, n CW, GB
•		integerrimus	Grassland, open forest; 150-3600m. KR, NCoRI, CaR, SN (exc Teh), GB
••		jacobaea*	Pastures, roadsides, disturbed places; <1500m. NCo, W KR, sw CaR, n SN, n ScV, SnFrB
•		layneae	Dry pine/oak woodland, on serpentine; 200-1000m. n SNF (El Dorado, Tuolumne Cos.)
•		lyonii	Hillsides; <500m. s Chl (Santa Catalina, San Clemente islands)
••		triangularis	Wet meadows, streambanks in open, coniferous forest; 100-3500m. KR, CaR, SN, SnGb, SnBr, PR, MP

Subtribe *Blennospermatinae*

•	Blennosperma	bakeri	Vernal pools, wet grasslands; <100m. NCoR, ne SnFrB (s Sonoma Co.)
•		nanum	Grassland, scrub, woods, gen wet, open areas; <1600m. NCoR, SNF, GV, CW, SCo, Chl
•	Crocidium	multicaule	Snady soils, grassland, open woodland; gen <1500m. NCoR, SNF, e SnFrB, SCoR (very uncommon), MP

Subtribe *Tussilaginaceae*

•	Cacaliopsis	nardosmia	Meadows, open forest, sometimes serpentine; 200-1900m. KR, NCoR
•	Lepidospartum	latisquanum	Sandy or gravelly pine/juniper woodlands, open scrubland; 1400-1500m. SnGb (n slope), W&I, DMtns
•		squamatum	Sandy or gravelly washes, stream terraces; <1800m. SNF, SCoRI, SW, D
••	Luina	hypoleuca	Rocky places, cliffs, sometimes on serpentine; <1200m. KR, NCoR, sw SnFrB
•	Tetradymia	argyraea	Pinyon/juniper woodland; 1400-2100m. DMtns.
•		canescens	Sagebrush scrub, pinyon/juniper woodland, forest; (400) 1600-3300m. TR, s PR, GB, DMoj
•		comosa	Coastal scrub, chapparal, sagebrush scrub; 300-1500m. TR, PR

Cape Ivy Year 4 donors

We want to thank the following individuals and organizations for their donations and pledges to the Cape ivy biocontrol program. Many of those on the list have generously donated for this fund in past years.

USDA - BLM	2,900	SCV	500
Boz Wms	17,352	Friends of Los Penasquitos	500
JiJi Foundation	10,000	Tamalpais Conservation Club	1,000
CDPR	10,000	Temescal Canyon Associates	500
CNPS State	2,000	Strong Foundation	2,000
San Diego	1,000	Elizabeth Crispin	500
LA/SMM	1,000	Bob Soost	225
Yerba Buena	500	Ralph Waycott	100
South Coast	100	Winston Salser	10,000
East Bay	1,000	Jean Conner	1,000
Monterey Bay	1,025	**Total**	**62,702**

Symposium 2001

Mark your calendars for Oct. 5–7 when CalEPPC will hold its 10th Anniversary Symposium at the Handlery Hotel in San Diego. While plans are still in flux as to the exact program, we will have an entire sessiond devoted to desert weed issues. Three field trips are already in the planning. Our next newsletter will have details, as will the web site. In addition, we will mail the usual program announcement and registration form to all members.