California Plant Pest & Disease Report

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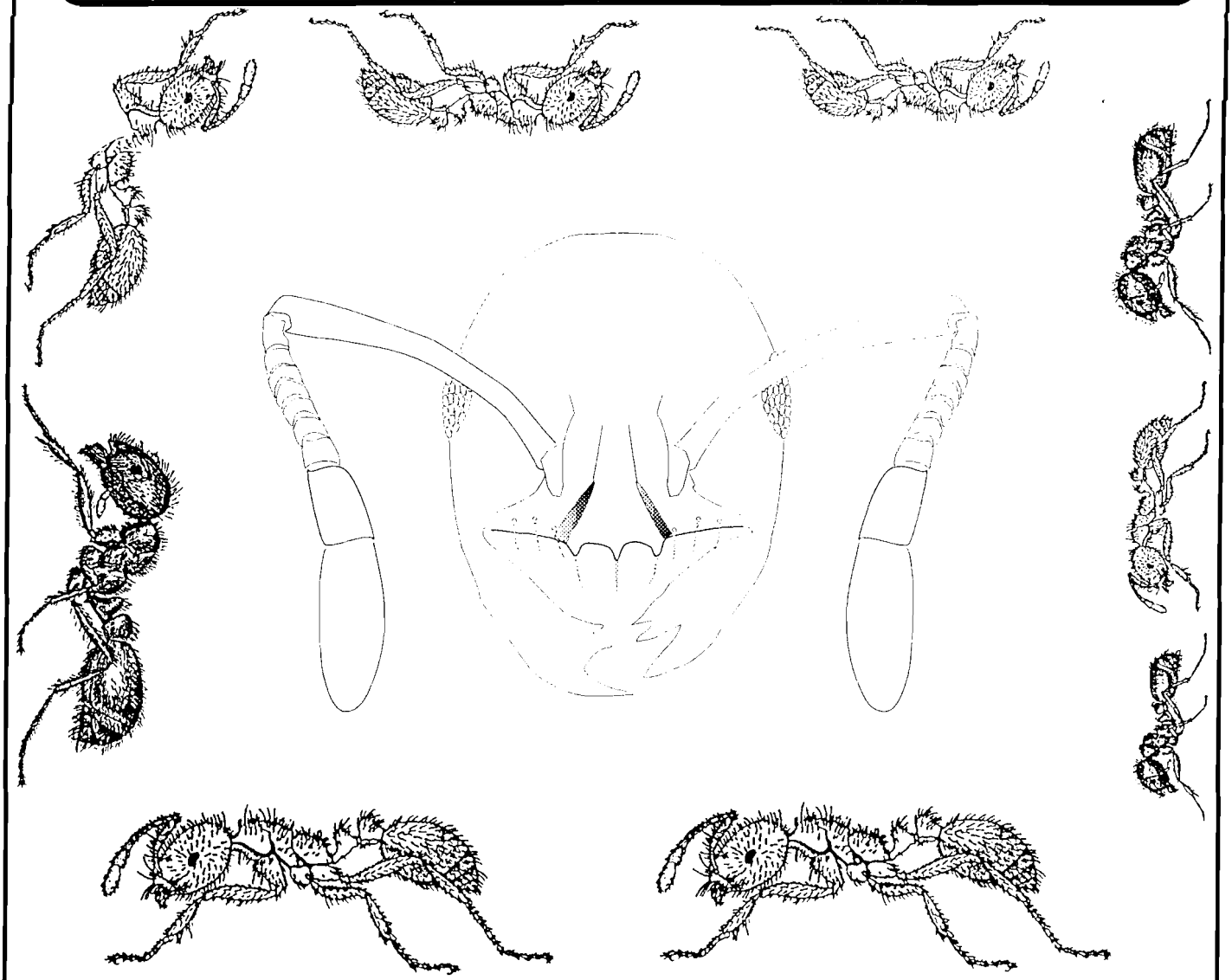

What's Inside:
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California Plant Pest & Disease Report

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ENTOMOLOGY HIGHLIGHTS

NAME CHANGES AND NEW SPECIES OF QUARANTINE SIGNIFICANCE

THRIPS

The new species of thrips discovered attacking avocado fruit in 1996 in Ventura county [CPPDR, 1996, 15(1-2):4] has now been described officially. The new name is ***Scirtothrips perseae***, suggested name "avocado thrips," and the description is by Steve Nakahara, thrips specialist at the USDA Systematic Entomology Laboratory in Beltsville, Maryland. The paper appeared in Insecta Mundi, 1997, 11(2):189-192. This thrips now occurs in all avocado producing counties in southern California (see up-date under New County Records in this issue), and apparently, Dr. Mark Hottle at U.C. Riverside has found it in Puebla and Vera Cruz, Mexico.

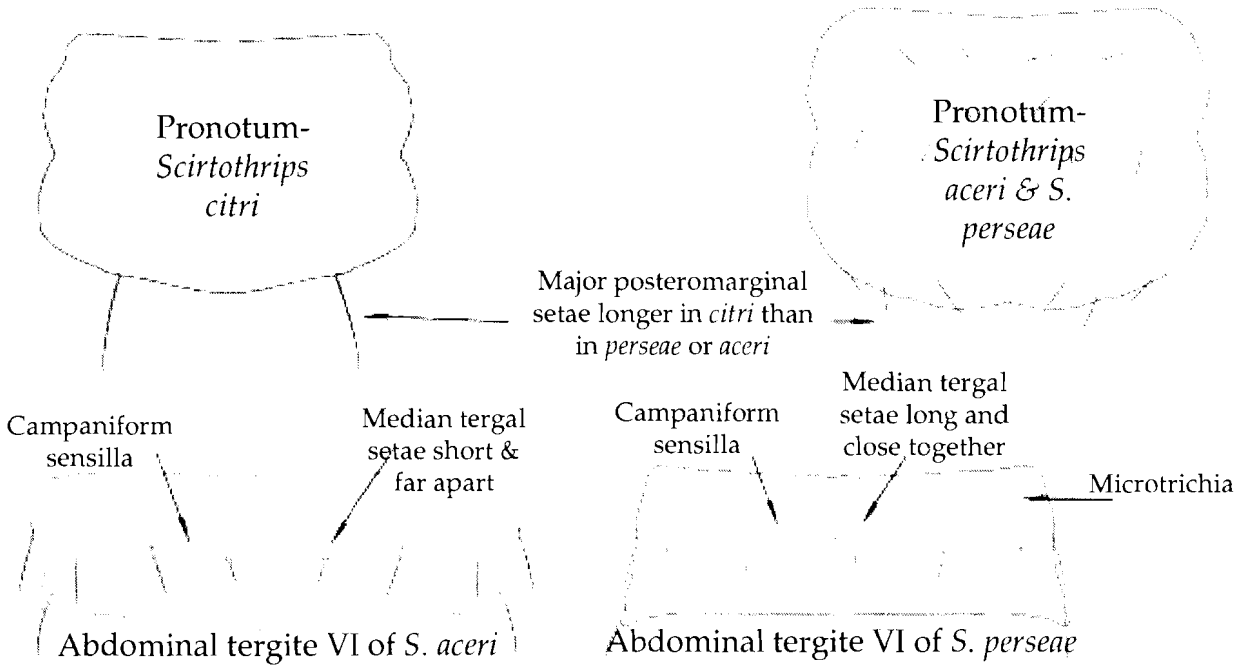


Fig. 1. Comparisons of the avocado thrips with two other California *Scirtothrips* species.

MEALYBUGS

There have been several recent changes in nomenclature for mealybug species which occasionally are found in quarantine situations.

The species *Dysmicoccus bispinosus* Beardsley has been found in nursery situations in the Los Angeles area a number of years ago, and it has been found on bananas coming from Ecuador (but mis-identified as *Dysmicoccus alazon*). Recent work by D.R. Miller and S. Polavarapu [Proc. Entomol. Soc. Wash. 99(3): 440-460] indicates that *bispinosus* is actually a synonym of *Dysmicoccus texensis* (Tinsley). Tinsley described this species in 1900 from *Acacia farnesiana* at San Diego, Texas. Jack Beardsley described *Dysmicoccus bispinosus* in 1965 from *Acacia cornigera* at Oaxaca, Mexico. Miller and Polavarapu adjust the taxonomic key to the *Dysmicoccus* species of North America by Miller and McKenzie (1973) [Hilgardia 41(17):489-542] to account for this nomenclatural change and to account for the newly described species *Dysmicoccus vaccinii*, a species attacking blueberries in the northeast. This key, and the one by Williams and

by Williams and Granara de Willink (1992) in the book Mealybugs of Central and South America have the two species, *bispinosus* and *texensis*, come out in the same couplet, so there is an easy change to be made in these keys.

An undescribed species of mealybug has been intercepted for years coming out of Florida on citrus and aglaonema. It has been found several times in California on aglaonema plants used as indoor decoratives. The species has recently been described by D.R. Miller and D.J. Williams, 1997 [Proc. Entomol. Soc. Wash 99(2):305-311]. The species is called *Pseudococcus odermatti.* The authors did not suggest a common name for this species but we have been using the name aglaonema mealybug for a number of years. It is not known if the species still occurs in California, since it has been eradicated from aglaonema whenever found. This new species is very similar to Comstock mealybug, *Pseudococcus comstocki*, but lacks the translucent coxal pores on the hind legs and has no ventral multilocular pores on abdominal segment II. The mealybug is also found on *Annona, Diospyros, Fatsia, Pittosporum*, and *Pyracantha*. It is known from Florida, Hawaii, Bahamas, Belize, Costa Rica, Japan, China and Hong Kong.

SIGNIFICANT FINDS

Many Tephritid fruit flies were trapped in California during 1997. The species include the Mediterranean fruit fly, the Oriental fruit fly, the Mexican fruit fly, the peach fruit fly, the guava fruit fly, and the melon fly. Most of the catches did not indicate that an infestation existed. However, larvae of the Mediterranean fruit fly were found in the area of Walnut Park, **Los Angeles** County. Larvae of the Oriental fruit fly were found in the cities of Lennox and Westchester, also in **Los Angeles** County. For a list of the fruit flies trapped during 1997 see the charts on pages 35-38.

JAPANESE BEETLE, *Popillia japonica*, -(A)- Several single collections of Japanese beetle were made from traps this year in the following locations. No infestations were found.

San Jose	**Santa Clara** County	6/26/97	Baur
Atwater	**Merced** County	7/1/97	Worthley
Corona	**Riverside** County	7/2/97	Iniquez
Ontario	**San Bernardino** County	7/28/97	Davey
Irvine	**Orange** County	7/30/97	Joseph
Oakland	**Alameda** County	7/31/97	Meyers
Ontario	**San Bernardino** County	8/5/97	Sarmiento
Oakland	**Alameda** County	8/8/97	Meyers

GYPSY MOTH, *Lymantria dispar*, -(A)- This serious tree pest was collected several times this year in the following locations. No infestations were found.

Escondido	**San Diego** County	7/9/97	Roseberry
Grass Valley	**Nevada** County	7/10/97	Landon
Moraga	**Contra Costa** County	7/30/97	Vargas
Glen Avon	**Riverside** County	7/31/97	Iniquez
So. Lake Tahoe	**El Dorado** County	8/11/97	Copple
Bakersfield	**Kern** County	8/27/97	Mydland

PINK BOLLWORM, *Pectinophora gossypiella* -(A)- A total of 359 native (non-sterile) moths were collected this year in the San Joaquin Valley. See chart on page 39 for catches over the last 31 years. This is an industry funded management program.

Mediterranean Fruit Fly, *Ceratitis capitata*, -(A)- 1997 Collections*

County	City	Date	#M/F/Stage	Trap	Host	Collectors
Los Angeles	Walnut Park	9/25/97	F	McPhail	Peach	Marks
Los Angeles	Walnut Park	9/27/97	2F	McPhail	Guava	Baltazar
Los Angeles	Walnut Park	9/27/97	F	McPhail	Grapefruit	Baltazar
Los Angeles	Huntington Park	9/28/97	F	McPhail	Grapefruit	Vega
Santa Clara	Milpitas	9/29/97	M	Jackson	Apple	Russell
Los Angeles	Walnut Park	9/29/97	F	McPhail	Guava	Galindo
Los Angeles	Walnut Park	9/29/97	4L	Orange	Guava	Winters
Los Angeles	Walnut Park	9/30/97	3M	Jackson	Guava	Galindo
Los Angeles	Walnut Park	9/30/97	F	McPhail	Guava	Galindo
Los Angeles	Walnut Park	10/1/97	2M	Jackson	Guava	Galindo
Los Angeles	Walnut Park	10/1/97	F	McPhail	Guava	Marks
Los Angeles	Walnut Park	10/1/97	F	McPhail	Guava	Galindo
Los Angeles	Walnut Park	10/1/97	3L	in fruit	Psidium	O'Sullivan
Los Angeles	Walnut Park	10/1/97	L	in fruit	Psidium guajava	Winters
Los Angeles	Walnut Park	10/2/97	M	Jackson	Guava	Galindo
Los Angeles	Walnut Park	10/2/97	M	Jackson	Guava	Galindo
Los Angeles	Walnut Park	10/2/97	M	Jackson	Guava	Gutierrez
Los Angeles	Walnut Park	10/2/97	F	McPhail	Guava	Galindo
Los Angeles	Walnut Park	10/2/97	77L	in fruit	Psidium guajava	Ruiz
Los Angeles	Walnut Park	10/3/97	F	McPhail	Orange	Moreno
Los Angeles	Walnut Park	10/3/97	F	McPhail	Guava	Galindo
Los Angeles	Walnut Park	10/3/97	F	McPhail	Guava	Galindo
Los Angeles	Walnut Park	10/4/97	1L	in fruit	Psidium guajava	Penrose
Los Angeles	Walnut Park	10/4/97	M	McPhail	Guava	Moreno
Los Angeles	Walnut Park	10/6/97	F	McPhail	Guava	Bracamontes
Los Angeles	Walnut Park	10/6/97	7L	in fruit	Psidium guajava	Gonzales
Los Angeles	Walnut Park	10/7/97	5L	in fruit	Psidium guajava	Bristow
Los Angeles	Walnut Park	10/8/97	4L	in fruit	Psidium	Ayala
Los Angeles	Walnut Park	10/8/97	43L	in fruit	Psidium	Winters
Los Angeles	Walnut Park	10/8/97	15L	in fruit	Psidium	Wooden
Los Angeles	Walnut Park	10/8/97	6L	in fruit	Psidium guajava	Gonzales

* Infestations were found only at those locations where larvae were collected, other finds do not constitute infestations

Oriental Fruit Fly, *Bactrocera dorsalis*, -(A)- 1997 Collections*

County	City	Date	#M/F/Stage	Trap	Host	Collectors
Alameda	Berkeley	6/16/97	M	Jackson	Apricot	Tadesse
Los Angeles	Los Angeles	6/30/97	M	Jackson	Loquat	Weider
Los Angeles	Covina	6/30/97	M	Jackson	Apricot	Vargas
Los Angeles	Torrance	7/8/97	M	Jackson	Lemon	Barrera
Los Angeles	Los Angeles	7/14/97	M	Jackson	Tangerine	Dominguez
Kern	Bakersfield	7/14/97	M	Jackson	Nectarine	Cruz
Los Angeles	Covina	7/16/97	M	Jackson	Fig	Lopez
Los Angeles	Covina	7/16/97	M	Jackson	Orange	Lopez
Los Angeles	Los Angeles	7/16/97	M	Jackson	Peach	Avila
Los Angeles	Covina	7/17/97	3M	Jackson	Grapefruit	Lopez
Los Angeles	Covina	7/18/97	2M	Jackson	Orange	Lopez
Los Angeles	Covina	7/23/97	F	McPhail	Fig	Lopez
San Diego	San Diego	7/23/97	M	Jackson	Lemon	Silva
San Diego	San Diego	7/28/97	M	Jackson	Peach	Wise
Los Angeles	Hawthorne	8/4/97	M	Jackson	Lemon	Buettgenbach
San Diego	Mira Mesa	8/4/97	F	McPhail	Fig	Feeley
San Diego	Lemon Grove	8/11/97	M	Jackson	Fig	Sharon
Los Angeles	Palos Verdes Estates	8/18/97	M	Jackson	Grapefruit	Ortiz
Los Angles	Valinda	8/18/97	M	Jackson	Hibiscus	Wissa
Orange	Santa Ana	8/18/97	M	Jackson	Jujube	Hernandez
Los Angeles	Palos Verdes Estates	8/20/97	M	Jackson	Apple	Dixon
Los Angeles	Palos Verdes Estates	8/20/97	M	Jackson	Olive	Dixon
Los Angeles	Palos Verdes Estates	8/20/97	M	Jackson	Orange	Dixon
Los Angeles	Palos Verdes Estates	8/20/97	M	Jackson	Orange	Dixon
Los Angeles	Palos Verdes Estates	8/20/97	M	Jackson	Grapefruit	Dixon
Los Angeles	Westchester	8/21/97	2M/4F	McPhail	Orange	Buettgenbach
Los Angeles	Westchester	8/22/97	M	Jackson	Avocado	Gutierrez
Los Angeles	Westchester	8/22/97	2L/1P	Jackson	Orange	Ruiz/Ayala
Los Angeles	Palos Verdes Estates	8/22/97	M	Jackson	Peach	Dixon
Los Angeles	Manhattan Beach	9/3/97	M	Jackson	Eucalyptus	Buettgenbach
Los Angeles	Pasadena	9/4/97	M	Jackson	Orange	Cisneros
Los Angeles	Pasadena	9/5/97	M	Jackson	Ornamental	Vega
Los Angeles	Del Aire	9/10/97	5F	McPhail	Apple	Buettgenbach
Los Angeles	Del Aire	9/10/97	F	McPhail	Pineapple guava	Buettgenbach
Los Angeles	Torrance	9/8/97	F	McPhail	Sapote	Carrera

* Infestations were found only at those locations where larvae were collected, other finds do not constitute infestations

(continued)

Oriental Fruit Fly, *Bactrocera dorsalis*, -(A)- 1997 Collections* (continued)

County	City	Date	#M/F/Stage	Trap	Host	Collectors
Los Angeles	Diamond Bar	9/9/97	M	Jackson	Peach	Griffith
Los Angeles	Hawthorne	9/9/97	F	McPhail	Peach	Ashak
Los Angeles	Del Aire	9/10/97	M	Jackson	Orange	Dixon
Los Angeles	Diamond Bar	9/11/97	M	Jackson	Lemon	Griffith
Los Angeles	Torrance	9/11/97	F	McPhail	Sapote	Barrera
Los Angeles	Lennox	9/11/97	M	Jackson	Peach	Armendariz
Los Angeles	Diamond Bar	9/13/97	M	Jackson	Ornamental	Gorman
Ventura	Oxnard	9/15/97	F	McPhail	Peach	Bullicer
Los Angeles	Lennox	9/15/97	3L	in fruit	Citrus sinensis	Ruiz
Los Angeles	West Covina	9/15/97	M	Jackson	Orange	Maciel
Los Angeles	Los Angeles	9/16/97	M	Jackson	Guava	Carrera
Los Angeles	West Covina	9/22/97	M	Jackson	Olive	See
Ventura	Fillmore	9/24/97	F	McPhail	Apple	Zegers
Los Angeles	Palos Verdes Estates	9/24/97	F	McPhail	Orange	Gorman
San Diego	Lemon Grove	9/30/97	M	Jackson	Sapote	Sharon
Los Angeles	Del Aire	10/2/97	3F	McPhail	Apple	Snyder
Los Angeles	Del Aire	10/2/97	F	McPhail	Fig	Snyder
Los Angeles	Del Aire	10/2/97	F	McPhail	Olive	Snyder
Los Angeles	Woodland Hills	10/6/97	1M/1F	McPhail	Fig	Young
Los Angeles	Sylmar	10/7/97	M	Jackson	Peach	Stuhley
Los Angeles	Woodland Hills	10/9/97	M	Jackson	Pineapple guava	Gutierrez
Los Angeles	Woodland Hills	10/10/97	M	Jackson	Fig	Gutierrez
Los Angeles	Palos Verdes Estates	10/15/97	F	McPhail	Fig	Ortiz
Los Angeles	Woodland Hills	10/15/97	F	Jackson	Orange	Gutierrez
Los Angeles	Lennox	10/16/97	M	McPhail	Lemon	Ashak
Los Angeles	Lennox	10/17/97	F	McPhail	Psidium guajava	Dominguez
San Diego	Poway	10/20/97	M	Jackson	Apple	Wube
Los Angeles	Santa Clarita	10/22/97	M	Jackson	Apricot	Vingua
Los Angeles	Lennox	10/23/97	M	Jackson	Psidium guajava	Wieder
San Diego	Spring Valley	11/18/97	M	Jackson	Orange	Sharon
Los Angeles	Diamond Bar	12/1/97	F	McPhail	Lemon	Griffith
Los Angeles	North Hollywood	12/10/97	M	Jackson	Lemon	Torres
Los Angeles	North Hollywood	12/10/97	M	Jackson	Lemon	Burleson

* Infestations were found only at those locations where larvae were collected, other finds do not constitute infestations

Guava Fruit Fly, *Bactrocera correcta*, -(A)- 1997 Collections*

County	City	Date	#M/F/Stage	Trap	Host	Collectors
Orange	Garden Grove	8/20/97	M	Jackson	Walnut	Smith
Orange	Westminster	8/7/97	M	Jackson	Macadamia	Rodriguez/Viote
Santa Clara	Milpitas	8/21/97	M	Jackson	Peach	Martinez

Peach Fruit Fly, *Bactrocera zonatus*, -(A)- 1997 Collections*

County	City	Date	#M/F/Stage	Trap	Host	Collectors
Alameda	Union City	9/25/97	M	Jackson	Peach	Cutler
Alameda	Union City	10/15/97	M	Jackson	Persimmon	Greer

Melon Fly, *Bactrocera cucurbitae*, -(A)- 1997 Collections*

County	City	Date	#M/F/Stage	Trap	Host	Collectors
Los Angeles	Florence	9/8/97	M	Jackson	Peach	Sandoval

Mexican Fruit Fly, *Anastrepha ludens*, -(A)- 1997 Collections*

County	City	Date	#M/F/Stage	Trap	Host	Collectors
Los Angeles	Boyle Heights	8/19/97	M	McPhail	sapote	Gorman
Los Angeles	Boyle Heights	10/10/97	F	McPhail	sapote	Vingua
Los Angeles	Arcadia	9/11/97	M	McPhail	Grapefruit	Cabacungen

*No infestations were found at any of these locations.

Historical Data on the Collections of Pink Bollworm in the San Joaquin Valley

Year	Fresno	Kern	Kings	Madera	Merced	Tulare	Total
1997	15	188	51	6	24	75	359
1996	22	75	25	3	30	46	201
1995	11	49	12	0	9	32	113
1994	25	113	11	1	5	46	201
1993	3	30	4	0	1	13	51
1992	21	68	7	1	8	10	115
1991	79	151	16	1	0	16	263
1990	108	1,588	59	7	18	1,459	3,239
1989	20	121	11	2	2	10	166
1988	70	265	282	10	9	255	891
1987	71	116	66	3	0	38	294
1986	3	42	5	1	0	11	62
1985	87	39	6	1	7	20	160
1984	3	305	7	0	3	33	351
1983	18	761	45	2	6	31	863
1982	13	87	8	3	6	3	120
1981	18	576	36	0	0	47	677
1980	354	1,504	465	0	2	2,167	4,492
1979	15	489	29	20	4	197	754
1978	4	22	8	1	2	32	69
1977	25	6,058	50	0	0	1,269	7,402
1976	3	1,260	19	0	0	192	1,474
1975	5	180	3	0	3	54	245
1974	1	374	5	1	0	56	437
1973	0	25	0	0	0	0	25
1972	0	31	0	0	0	5	36
1971	1	3	0	0	0	8	12
1970	0	13	0	0	0	0	13
1969	0	5	0	0	0	0	5
1968	0	0	0	0	0	0	0
1967	0	4	0	0	0	0	4

SIGNIFICANT FINDS
(continued)

AFRICANIZED HONEYBEE, *Apis* "Africanized" -(A)- A sample of bees collected from farm machinery in **Glenn** County were found to be positive for Africanized honeybee. The sample was collected by a local bee keeper after several individuals had been stung. It was determined that the machinery had recently been brought to Glenn County from a site in Maricopa County Arizona, near Phoenix. The hive was destroyed and traps have been placed in the vicinity.

SWEETPOTATO WEEVIL, *Cylas formicarius elegantulus* -(A)- Following earlier finds of this weevil in **San Diego** County [CPPDR 15(5-6):158 & 16(1-2):9], extensive surveys and trapping were conducted. The weevil is now known from the following San Diego County communities: Chula Vista, San Diego, Jamul, Spring Valley, National City, La Mesa, El Cajon, Lemon Grove and Mira Mesa. Trapping was also conducted in Los Angeles, Orange, Riverside, and San Bernardino Counties with negative results.

GRAPE PHYLOXERA, *Daktulosphaira vitifoliae* -(C)- This aphid relative has been a severe and very notorious pest of grapes in California and other parts of the world for over a century. It is native to the eastern United States. It has a complex biology, with part of the population occurring on the roots and part on the leaves. The leaf feeding population causes leaf galls. The leaf gall form has been extremely rare in California, having been found only a few times. This year seems to be an exception, since two widely separated collections of the leaf gall form have been collected. Collections were made at Hopland, **Mendocino** County on August 27 by Bill Ogden. The collection was made from a nursery. The other collection was from a small commercial vineyard at Gonzales, **Monterey** county. This collection was made by County Biologist Brad Oliver on September 22.

DICHONDRA FLEA BEETLE, *Chaetocnema repens* -(A)- This flea beetle has been a serious pest of dichondra for years, and is a major reason why dichondra lawns are practically non-existent in California. The general concensus was that the beetle was restricted to this host. However, this is not the case. See the following report by Dr. Jeff Kollenkark, an Agronomist in the Fresno County area:

> "Significant damage in hundreds of lawns, golf courses and sports fields have been noted in the Fresno-Clovis area on both common and hybrid Bermudas from this pest over the past three years. Samples were sent in 1996 to Dr. Fred Andrews at CDFA and also to Dr. David Shetlar at Ohio State to properly identify the beetle present at numerous sites in high populations. Symptoms included an overall appearance of lack of water or fertilizer burn.
>
> Close inspection showed linear white banding along the length of the leaf blade. This occasionally reached the point were the turf was nearly all bleached out. First signs appear in March, and finally subside in September as temperatures drop. Applications of a surface feeder insecticide would result in green-up over a 1-2 week period. As populations rebuild, symptoms often reappear in 3-6 weeks."

NEW STATE RECORDS

A number of new insects were reported established in California this year. A significant pest establishment is the imported fire ant infestation in Kern County. See the special report on this on pages50-55. Two of the new pests, bougainvilla mite and an Australian eucalyptus borer, were covered in the last issue of CPPDR [16(1-2):12]. Following are the new finds not previously reported in CPPDR.

RED IMPORTED FIRE ANT, *Solenopsis invicta* -(A)- This ant was found previously in two nursery situations in California [CPPDR , 1992, 11(1-2):10]. These were not considered a state record, but the current infestation near Buttonwillow, Kern Co., can be considered a new state record. The infestation is currently under eradication. See complete story on pages50-55.

CHENOPODIUM PSYLLID, *Trioza chenopodii*, -(Q)- This psyllid was collected for the first time in California on November 8 at Salinas, **Monterey** County. The collection was made by Monterey County Biologist Brad Oliver from *Chenopodium* (probably lamb's quarters or near). This psyllid is part of about a dozen species in a complex of forms native to the Palaearctic region. They are restricted to plants in the Chenopodiaceae, including spinach (*Spinacia oleracea*) and beets (*Beta vulgaris*). The nymphs of this group of species are known to cause malformations on the leaves of some hosts.

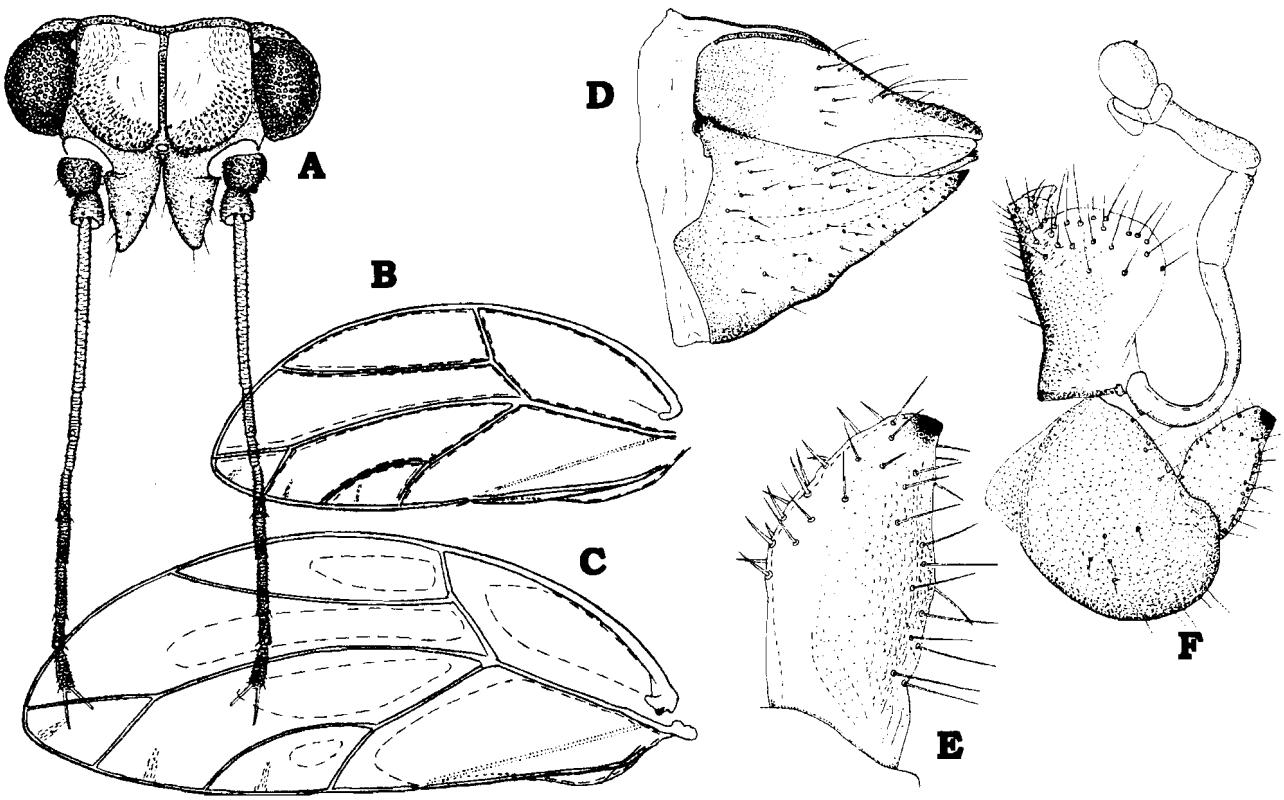


Fig. 2: Morphological structures of *Trioza chenopodii*: A. anterodorsal view of head. B-C. short wing winter morph vs. long winged summer morph. D. female ovipositor. E. male paramere in lateral view. F. male terminal abdominal segments. Adapted from Ossiannilsson, 1992: The Psylloidea of Fennoscandia and Denmark. E.J. Brill Leiden (Fauna Entomol. Scandinavica Vol. 26).

This particular species has been used to control weeds in the Middle East. It also feeds on the widest range of hosts within the Chenopodeaceae including also the plant genera *Atriplex* and *Halimione*. In Czechoslovakia it has been grown on fodder beets and sugar beets, as well as spinach, but it seems to prefer *Chenopodium album* when given a feeding choice. Therefore, its potential as a pest of sugar beets in California appears to be negligible. It is not known if it will be harmful to any of the native shadscales (*Atriplex*).

The species is light green color with the upper surfaces primarily black, a color combination also found on some California native species associated with willows. This psyllid apparently has two photoperiodically driven morphs which differ in coloration and wing length; the short winged form occurring in the winter. Our specimens were confirmed by Dr. Ian Hodkinson, a psyllid specialist at Liverpool Polytechnic in England. It is known from most of Europe, as far north as Denmark and Sweden, Canary Islands, Israel, India, Pakistan, Iran, Korea, Japan and Chile. In the United States it is recorded from Virginia.

CAESALPINIA PSYLLID, *Freysuila dugesii*, -(Q)- This psyllid is one of several in the genus that feed on leguminous shrubs and trees in *Caesalpinia* and *Poinciana*. The first California record comes from Palm Desert, **Riverside** County, where it was collected on a golf course by County Ag Biologist Richard Shaffer in January. The host was *Caesalpinia cacalaco*. This small shrub-like plant with yellow and orange flowers is being commonly planted these days in many southern California and Arizona locations. Our specimens were confirmed by Dr. Ian Hodkinson in England.

Little is known about this psyllid as it has been collected only sparingly over the years. It is most likely native to Mexico, the native home of the host. No apparent injury such as galling or malformations to the plants were noted. It is likely restricted to these hosts and whether it will cause damage to them in the future in ornamental plantings is unknown.

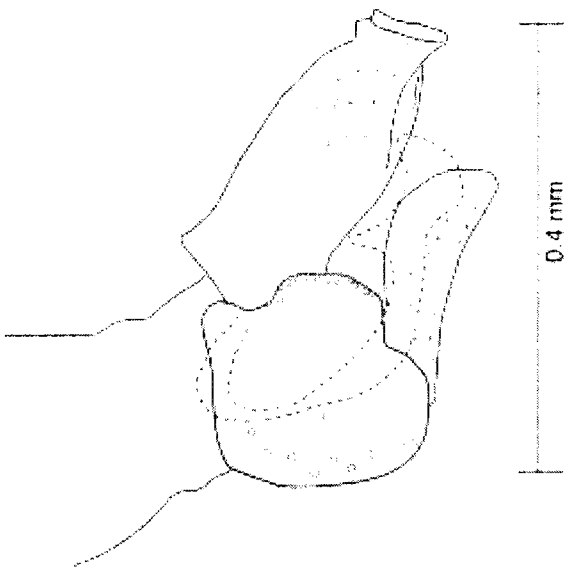


Fig. 3. Male terminal abdominal segments of caesalpinia psyllid, *Freysuila dugesii*. Adapted from an illustration by Chris Baptista, Arizona Department of Agriculture.

FARNESIANA PSYLLID. *Heteropsylla flexuosa* -(Q)- This psyllid is another group of species which, like caesalpinia psyllid, feed exclusively on trees and shrubs in the bean family (Fabiaceae=Leguminosae). This species was originally collected in California by R. Tiffer at a nursery in Brea, **Orange** County on May 14, 1996. The host was *Acacia farnesiana* (probably = *A. smallii*). It was subsequently recollected at two other nurseries in Orange County, one in the city of Orange, and the other at San Juan Capistrano. It has also been collected in Arizona. Outside of the US it is known from Mexico, Costa Rica and El Salvador, all on the same host. It is probably native to Central America. The species was originally correctly identified by Orange County Entomologist Nick Nisson in 1996, but publication of this new record was delayed because the original sample sent to a specialist for confirmation was lost in the mails. The identification was subsequently confirmed by Dr. Ian Hodkinson in England.

Like caesalpinia psyllid, there was no apparent injury such as galling or malformations to the plants. However, damage potential to the favored host is unknown. It is likely restricted to this particular host.

There are two other species of *Heteropsylla* species in California, one native and one introduced. The native species, *H. texana*, is readily recognized by the dark colorations along the apical wing veins (Fig. 4G). The introduced species have clear wings, but are easily separated by the shapes of the male parameres (Figs. 4A-F).

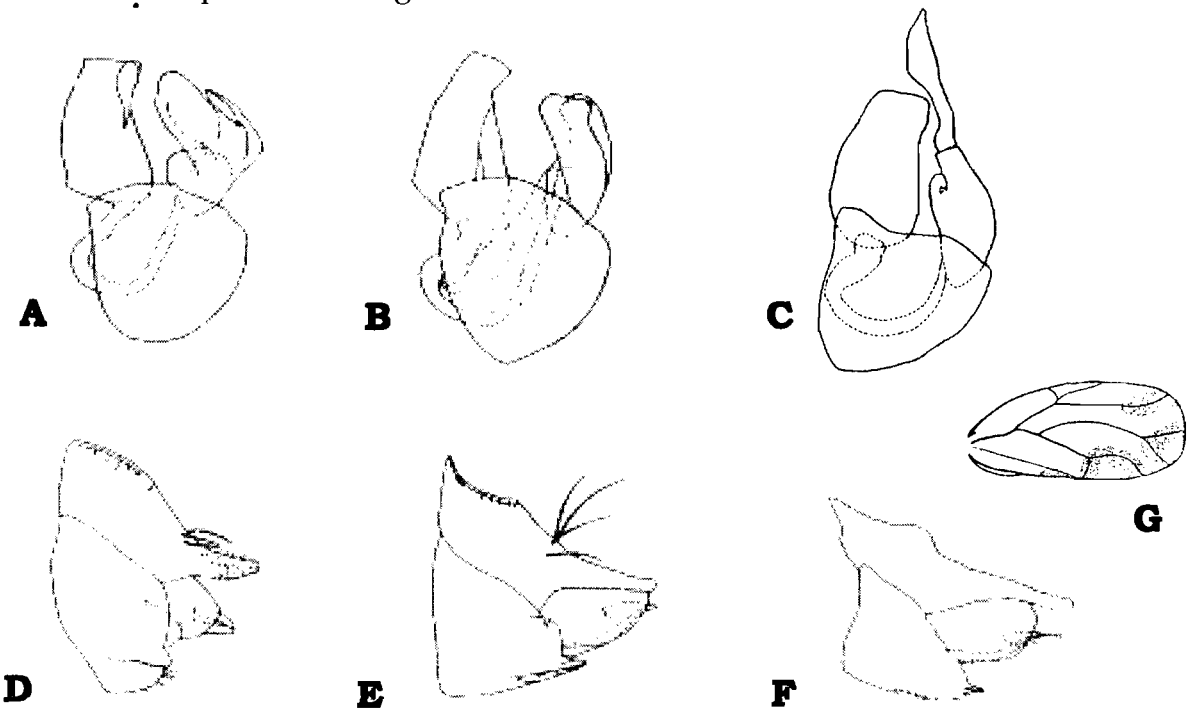


Fig. 4. Terminal abdominal segments of the California species of *Heteropsylla*. Male terminal segments of A: *H. flexuosa*; B: *H. cubana*; C: *H. texana*. Female terminal segments (ovipositors) of D: *H. flexuosa*; E: *H. cubana*; F: *H. texana*. G. forewing of *H. texana*. Illustrations A-F adapted from Muddiman et al, 1992, Bull. entomol. Res. 82:73-117. Illustration G taken from Crawford, 1914, U.S. Nat'l. Mus. Bull. 85:1-186.

Two new records of thrips have been reported from California, but these were not submitted to the Department of Food and Agriculture for identification. Dr. Laurence Mound, formerly the thrips specialist at the British Museum of Natural History, visited California for several months last summer at the request of Dr. Diane Ullman at UC Davis. Dr. Mound's primary charge was to study the color forms of the western flower thrips complex (*Frankliniella occidentalis*) and to observe the new avocoado infesting *Scirtothrips* in southern California. While here he collected and identified the following two species.

HEMEROCALLIS THRIPS, *Frankliniella hemerocallis* -(Q)- This thrips was collected in San Diego, **San Diego** County for the first California record. It was collected from daylilies (*Hemerocallis* sp.), the preferred host of this thrips. The species was originally described from specimens collected from daylilies in Wisconsin. In Wisconsin they were causing damage to the flowers, but in other cases they seem to stay in the leaf bases instead of in the flowers. It is probably non-economic on this host under most circumstances. It is also known to occur in Florida, Maryland, New York, Wisconsin, Bahamas, Bermuda and Japan. Very little is known about it. It is distinguished from the common western flower thrips, *Frankliniella occidentalis*, because the wings are dark colored in *hemerocallis*, and pale yellow or clear in *occidentalis*. On the east coast, it is often found on the same plants with *Frankliniella fusca* and *tritici*. Of these, only *fusca* is in California, but not common. Also, in California, the species *Tenothrips frici* will be found in the flowers of daylilies. All these species are very similar and probably cannot be field separated.

COLLARED THRIPS, *Aeolothrips collaris* -(Q)- This thrips was collected frequently near Davis, **Yolo** County, by Dr. Mound, where it was common in alfalfa fields. Collections were made during the summer months starting on June 6. This is a new California and North American record. It is a Palaearctic species known from continental Europe, Cyprus, North Africa, Madeira, Azores, Canary Islands, Iran, Transcaucasia to Central Asia, Bangladesh, Mongolia and India. It is known to infest mango, onion, mustard, clover, sugarcane, inflorescences of grasses and various thistles (*Centaurea*). It is generally considered a minor pest in those areas. About 80% of the known *Aeolothrips* species are predaceous, but this species is not known to be so. The thrips resembles many of the other California species of *Aeolothrips*, but differs in having the collar-like appearance of the prothorax. According to Steve Nakahara, thrips expert at the Systematic Entomology lab in Beltsville Maryland, it can be distinguished as follows:

> It differs from North American *Aeolothrips* with two brown cross bands on the forewings because the pronotum is completely yellow or with the median area lightly shaded brown; antennal segment III yellow with a brown apex and segment II yellow in distal 1/2 and shaded brown basally; abdomen brown or with the anterior segments paler; fore femur brown dorsally and pale in ventral part; and mid and hind femur brown with base paler.

A PAPER WASP, *Polistes dominulus*, -(Q)- This paper making wasp, native to Europe, has been found in a number of Central California locations this summer, including this building, the Plant Pest Diagnostics Center, in south Sacramento, **Sacramento** County, where it had been nesting in the second story window alcoves. It is also known from **Alameda** County, where California Vector Control authorities were concerned about it. The following information

about the wasp is adapted from a paper by Judd & Carpenter, 1996 [The Great Lakes Entomologist 29(1): 45-6]:

Polistes dominulus is a Palaearctic species where it is common from the Mediterranean region to China. It was first recorded from the United States at Cambridge, Massachusetts in 1981. By that time it had already spread to a wide area in and around Boston. Since then it has spread to New Jersey, Maryland, New York, Pennsylvannia, Ohio, Connecticut, Vermont and Michigan. It is also reported in Australia and Chile. The species appears to prefer sheltered nesting sites, especially around human habitations.

In another paper discussing the original collection in the Boston area, Hathaway 1981 [Psyche 88: 169-173] -(under the name *Polistes gallicus*) discusses some other facts about the wasp, including biology. It does not sustain itself well in the more northerly areas of Europe, but does well further south, and it appears that it will do well in California. In northerly locations where it does survive it will nest in enclosed locations such as metal containers and gutter pipes. In warmer climates, nests are built more in the open, where they hang from eaves, branches and other horizontal structures. As many as 500 cells have been observed in nests in Europe. The wasps are not overly agressive towards humans, allowing a very close approach to the nests. Whether or not these wasps will have any adverse effects on native wasps or cause other kinds of economic problems is unknown at this time, but pest exterminators will probably be receiving a lot of calls if it continues to be as prolific here as it has been so far.

Because of coloration, which is black and yellow, this wasp tends to resemble the yellow jackets (*Vespula*) rather than the native *Polistes* paper making wasps which are usually shades of yellow, red and tan. Although it flies like other *Polistes* species here , it is smaller than most. The amount of yellow coloration will vary considerably between individuals. See included illustration.

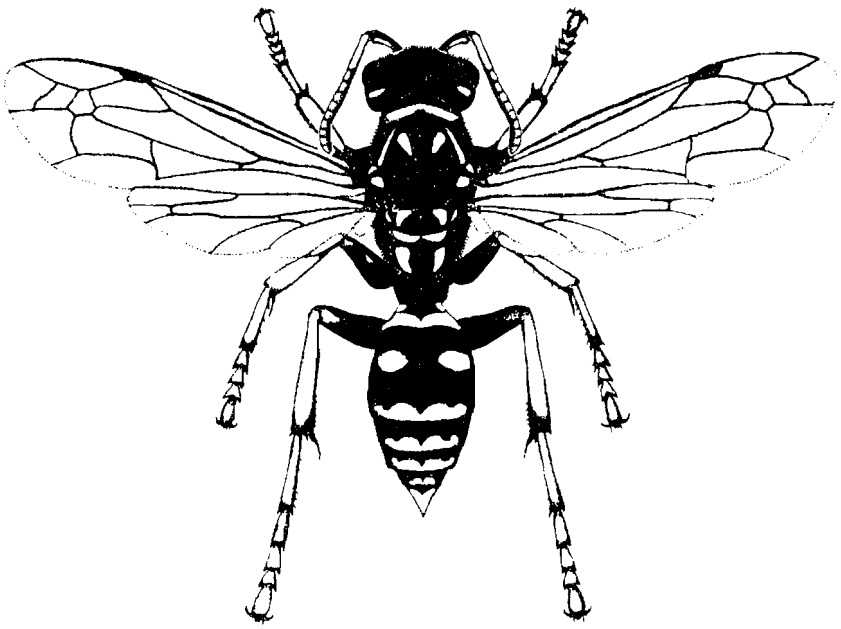


Fig. 5: Adult of the vespid wasp *Polistes dominulus*. Adapted from an illustration in Richards, 1980: Handbks. for the Ident. of British Insects 6(3b):1-118.

FICUS LEAF GALL WASP, *Josephiella* sp. -(Q)- This new, undescribed, gall forming wasp was found for the first time at Santa Ana, **Orange** County on July 1 by County Entomologist Nick Nisson. This is a new California and North American record. The wasps were causing galls in the leaves of *Ficus microcarpa* var. *nitida* trees planted along a street. The wasps have since been found in Newport Beach and Tustin in Orange County. According to reports by Nick Nisson, the wasps attack new growth. Heavy infestations produce a noticeable yellowing of the foliage. The galls are conspicuous warty blisters. Infested leaves fall to the ground, perhaps prematurely, where the adults emerge, although emergence holes can be found in leaves still on the tree. This damage should not be confused with the reddening and curling of the leaves caused by the common Cuban laurel thrips, *Gynaikothrips ficorum*. The adult wasps are 2mm long, dark brown or black with lighter legs and antennae (see the illustrations provided by Dr. Rosser Garrison, Los Angeles County Entomologist).

These wasps belong to the Hymenoptera, in the superfamily Chalcidoidea in a group of wasps in the Family Agaonidae. Probably most of the chalcid wasps are beneficial parasitoids, but a few, such as these, are plant feeders. This family contains many *Ficus*-feeding species including the well-known *Blastophagus* fig-pollinating wasps. Previously, other Agaonid fig wasps have been reported as new to California [see CPPDR 1994, 13(3-4):62-64], but these wasps are associated with the flowers and fruit, and do not cause leaf galling. There is only one species described in this genus, and that is a gall former in India feeding on *Ficus bengalensis*. These leaf gall wasps were found in 1989 in Hawaii by Dr. Jack Beardsley, formerly on the faculty of the University of Hawaii. Dr. Beardsley has since returned to California, just in time to continue his studies of this wasp group, along with another specialist, Dr. Jean-Yves Rasplus at the Laboratoire de Modelisation et Biologie Evolutive in Montpellier, France.

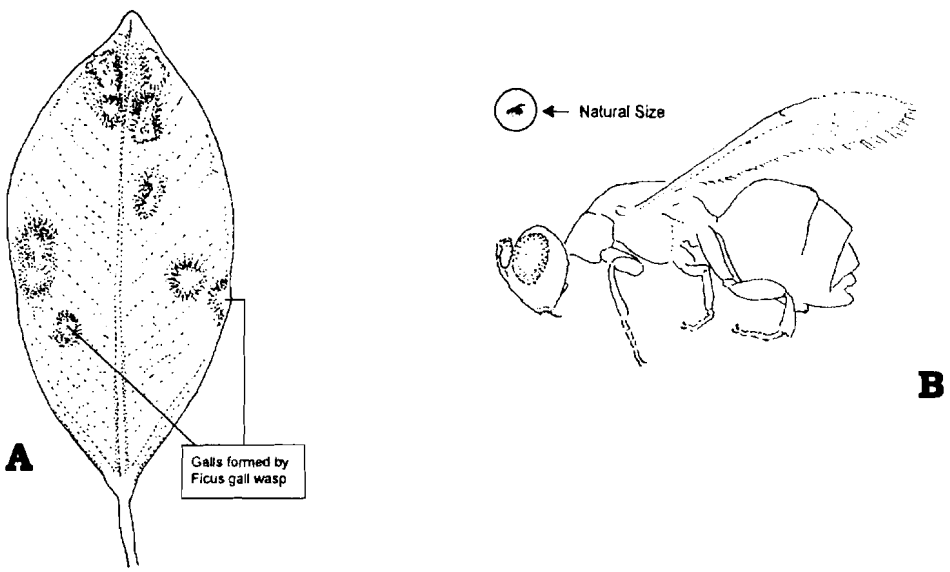


Fig. 6. A. Appearance of *Josephiella* galls on the leaves of *Ficus* . B. Lateral view of the adult *Josephiella* wasp. Illustrations by Dr. Rosser Garrison, Los Angeles County Department of Agriculture.

GOLDEN APPLE SNAIL, *Pomacea canaliculata* -(C)- This large snail species was collected from a reservoir near Miramar, **San Diego** County. This is a new California and North American record. See the following report by Bob Dowell (CDFA):

"The golden apple snail, *Pomacea canaliculata* Lamarck, has been found breeding in Lake Miramar in San Diego County. *Pomacea canaliculata* is native to Central and South America but it was introduced into parts of Asia for snail farming. It has escaped cultivation and become a pest of paddy rice seedlings in Taiwan and the Philippine Republic (Cheng 1989, Palvis et al 1989, Cowie [in press]).

Department of Fish and Game staff made the initial discovery in Lake Miramar in late 1997. Specimens of the snail were sent to Dr. Robert Cowie, Bishop Museum, Honolulu HI for identification. He identified the sample as *P. canaliculata*. Subsequent surveys by Department of Food and Agriculture (CDFA) staff found *P. canaliculata* eggs, immatures and breeding adults in Lake Miramar. Further surveys for this snail in other lakes and reservoirs in San Diego County are being conducted by CDFA staff.

Pomacea canaliculata and a related species, *P. bridgesii*, are common in the aquarium trade. CDFA staff purchased several snails that look like *P. canaliculata* in pet shops in Sacramento, the San Francisco bay area, and San Diego County. These snails have been sent to Dr. Cowie for identification and those from San Jose were identified as *P. canaliculata*. The taxonomy of the group is unclear and identification requires an expert with an extensive reference collection.

CDFA will evaluate its options for dealing with this pest after receiving the results of the surveys from San Diego County. Regulatory action would be required to prevent furtherdisemination of the snails through the aquarium trade.

References:

Cheng, E. Y. 1989. Control strategy for the introduced snail, *Pomacea lineata*, in rice paddy. In slugs and snails in World Agriculture. British Crop Protection Council Monograph 41, pp 69-75.

Cowie, R. H. in press. Apple snails as agricultural pests: their biology, impacts and management.

Palis, F. V., R. F. Macatula and L. Browning. 1996. Niclosamide, an effective molluscicide for the golden apple snail [*Pomacea canaliculata* (Lamarck)] control in Philippines rice production systems. In Slugs and Snail Pests in Agriculture. British Crop Protection Council Symp. Proc. No. 66, pp. 213-230."

These snails, in the family Ampullariidae, are large. Some populations average about 3 cm in diameter, yet other populations are known to be 7-8 cm and in some cases even 9 cm in diameter. The size ranges that occur may be the result of several species within the *canaliculata* complex of South American snails. The morphology-based taxonomy of the group is very difficult and species limits are in doubt. Because of the uncertainty of the species involved in various parts of the world, it is difficult to characterize biologies, habits, economics and control measures.

There are two other species of *Pomacea* in the contimerous United States, one native species *P. paludosa* (Say) and one introduced species, *P. bridgesii* (Reeve), in Florida. It is possible that these species, as well as others including *canaliculata*, are being used in the aquarium trade in the US, and several species have been introduced into other countries where they were introduced into aquaculture projects for human consumption. Apparently, in Fremont and Pleasanton, Alameda County, some apple snails found alive in terrestrial situations are probably from dumped aquariums. Several species of these snails are also known from Hawaii, where they are considered serious pests of taro, and they also have been introduced into Japan, Guam, New Guinea and Palau. Other South Pacific Islands and Australia are considered at risk for infestation. Economic damage is considered serious but difficult to quantify.

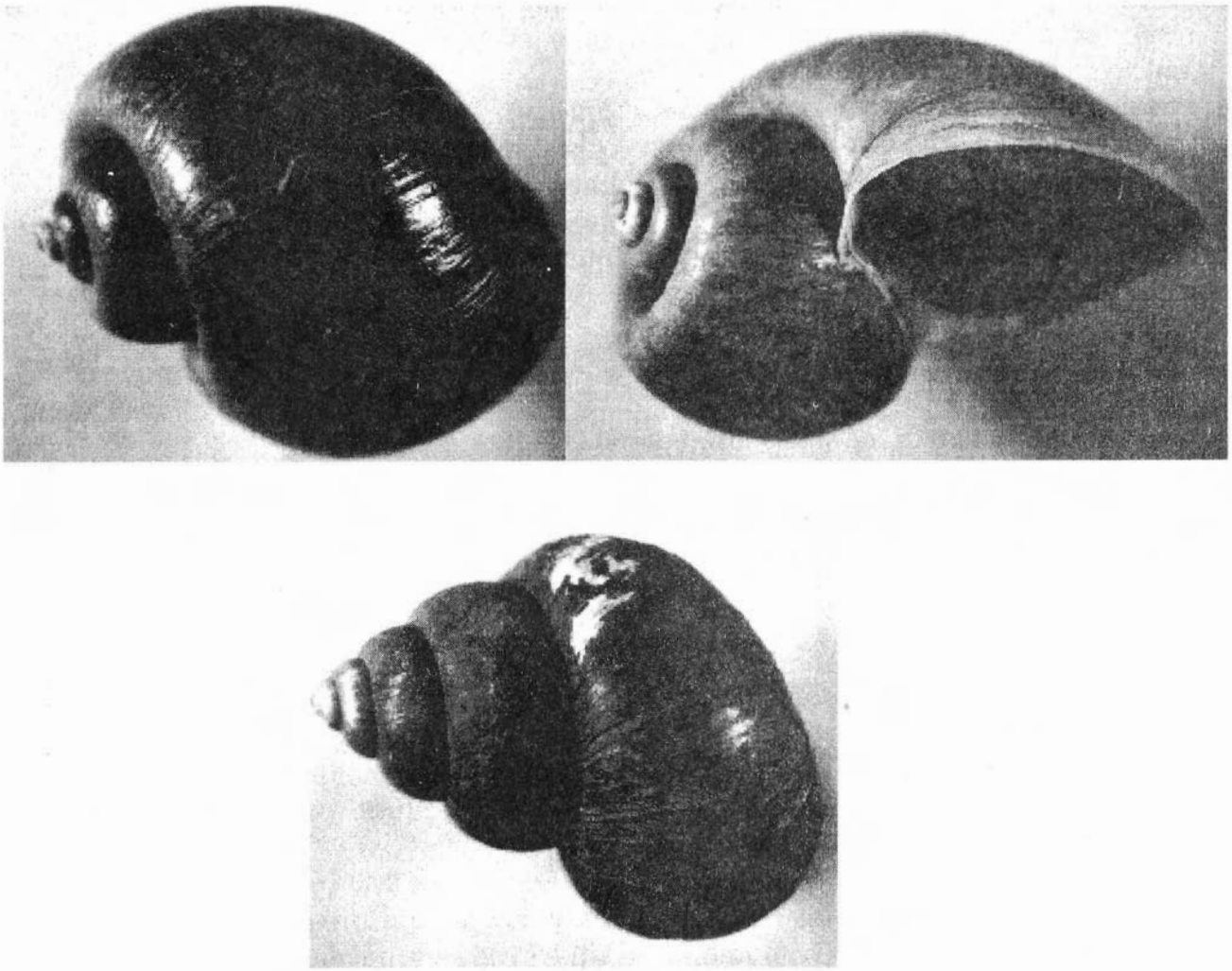
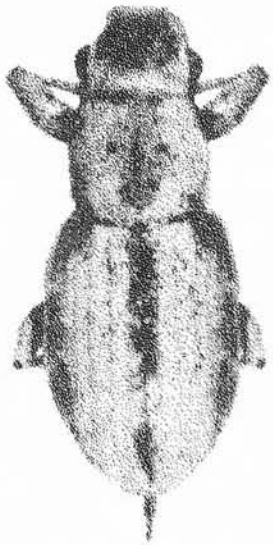


Fig. 7. Golden apple snail, *Pomacea canaliculata*, at top, left and right, compared with another large introduced California aquatic snail, *Viviparous* sp., at bottom. Note the flatter spiral in apple snail. Photographs are approximately life-size. Photos by Scott Kinnee & Tim Tyler, CDFA.

A GRASS APHID, *Melanaphis* sp., -(Q)- This aphid was collected at Woodlake, **Tulare** County in a shipment of Miscanthus grass, *Miscanthus sinensis*, arriving from a wholesale nursery in southern California. The collection was made on January 2 by Dennis Haines and Dave Bigham, both from the Tulare County Agricultural Commissioner's office. This genus of aphids is poorly understood, and these individuals cannot be identified to species level. The grass is commonly sold in the nursery trade, and the aphid is probably established in many California locations where the grass has been planted.

A WEEVIL, *Atrichonotus taeniatulus* (Berg)-(Q) This weevil was collected and recorded for the first time in California at McKinleyville, **Humboldt** County on October 6 by Agricultural Biologist Richard Spadoni. The weevils were crawling on the outside wall of a house. Another collection was made on October 18 under similar circumstances.

In a 1990 revision of the genus *Atrichonotus*, Lanteri and O'Brien give the following information on the distribution and plant associations: —*Atrichonotus taeniatulus* is native to the central and northern provinces of Argentina and Uruguay. It has been introduced into Chile, Juan Fernández Islands, Australia, New Zealand and the southeastern United States of America (Buchanan 1939; Kuschel 1972; Chadwick 1965) along with different crops. "Its habits are similar to those of Asy*nonychus* Crotch (Fuller rose beetle) and *Graphognathus* Buchanan (whitefringed beetles); feeding on a wide variety of plants with a preference for Leguminosae (Kuschel 1972:285)."



Atrichonotus taeniatulus

The list of plants associated with *A. taeniatulus* includes: lucern, subterranean clover, bean, *Phatinia glabra rubens*, dahlias, hibiscus, rose, "garden shrubs," eucalyptus, sunflower, and roots of grasses (Bosq 1943; Brewer 1974 and 1976; Chadwick 1965).

Of the two distinct color forms of *Atrichonotus taeniatulus*, only one was collected at the Humboldt site. All the specimens collected thus far are distinctly striped on the prothorax and elytra, and the general body shape and size is similar to the Fuller rose beetle (*Asynonychus godmani*).

Bosq, J. M. 1943. Segunda lista de Coleópteros de la República Argentina, dañinos a la agricultura. Min. Agri. Nac/Sanidad Vegetal, Buenos Aires. 80 pp.

Brewer, M. 1974. Sistemática y curva poblacional de adultos de *Pantomorus cinerosus* Boheman y *Pantomorus taeniatulus* (Berg). Col. Curc.) Rev. Fac. Cienc. Ex. Fis. Nat. Univ. Nac. Córdoba (Argentina) 103: 15-28.

Buchanan. L. L. 1939. The species of *Pantomorus* of America north of Mexico. U. S. Dept. Agric., Misc. Publ. 341:1-39.

Chadwick, C. F. 1965. Checklist of the Brachyderinae (Col. Curculionidae) occurring in Australia. J. Entomol. Soc. Aust. (N.S.W.)2:221-34.

Kuschel, G. 1972. The foreign Curculionoidea established in New Zealand (Insecta: Coleoptera). N. Z. J. Sci. 15(3): 273-289.

Lanteri, A. A. & C. W. O'Brien. 1990. Taxonomic Revision and Cladistic Analysis of *Atrichonotus* Buchanan (Coleoptera: Curculionidae). TAES, 116(3):697-725.

RED IMPORTED FIRE ANT, *Solenopsis invicta* -(A)- Red imported fire ants (RIFA) were found in Lost Hills, **Kern** County. Pallets holding bee hives imported from Texas were found to be infested with the ants on February 5, 1997, after unloading the pallets in an almond orchard. The site was monitored by CDFA and Kern County Department of Agriculture personnel for fire ant activity. On October 22, 1997, fire ants were found in the soil in the orchard and a more intensive survey was conducted. Eradication efforts have also begun. Following are two reports on this infestation and on fire ant in general.

RED IMPORTED FIRE ANT FOUND IN CALIFORNIA

Robert V. Dowell[1], Arthur Gilbert[1], & John Sorensen[2]

California Department of Food and Agriculture: [1] Pest Detection and Emergency Projects, 1220 N Street, Sacramento, CA 95833; [2] Plant Pest Diagnostics Center, 3295 Meadowview Road, Scaramento, CA 95832.

The red imported fire ant, Solenopsis invicta Buren (RIFA) is an exotic species that invaded the United States at Mobile, Alabama in the late 1930's or early 1940's. Since then it has colonized more than 106 million hectares in 11 southeastern states and Puerto Rico (D. F. Williams. 1994. pp. 282-292. In D. F. Williams (ed.). Exotic ants: Biology, impact and control of introduced species. Westview Press, Colorado). RIFA is a major public health and environmental problem throughout its U.S. range (Adams, C. T. 1986. pp. 48-57. In C. S. Lofgren & R. K. Vander Meer (eds.) Fire ants and leafcutting ants, Biology and management. Westview Press, Boulder Colorado; Lofgren, C. S. 1986. pp. 227-256. In S. B. Vinson (ed.) Economic impact and control of social insects. Praeger, New York; Porter, S. D., B. Van Eimeren & L. E. Gilbert. 1987. Ann. Entomol. Soc. Amer., 81:913-918). The California Department of Food and Agriculture (CDFA) considers RIFA to be a significant threat to the environment, agriculture and people of California.

RIFA is found regularly at the California Agricultural Inspection Stations. Between July 1990 and June 1996 this ant was intercepted on 809 occasions during vehicle inspections of nursery stock, trailers, trucks, etc.

On 5 Feb 1997, a truck carrying 512 honey bee colonies was inspected at the Vidal Border Agricultural Inspection Station (State Highway 62) and found to be contaminated with ants. Samples of the ants were collected and sent to the CDFA Plant Pest Diagnostics Center (PPDC) for identification. After a two day transit to PPDC, the sample was determined to be RIFA on 8 Feb 1997 and the border station and the Kern County Agricultural Commissioner were notified of the determination.

As per policy at that time, the truck was allowed to proceed, under a quarantine warning notice, to its destination. On 6 Feb, staff from the Kern County Agricultural Commissioner's office conducted an initial inspection of the bee hives and found the hives, truck, debris in the truck and the mud on the hives to be infested with ants. At this time the debris from the truck was removed and burned, the truck was sprayed with an aerosol insecticide and ants in the mud on the bee hives were treated with fuel oil.

Inspections on 7 Feb of the bee hives which had been distributed around the perimeter and along the roads through the 188 hectare (464 acre) almond orchard found ant colonies in packed mud between many of the hive boxes and in the pallets. Many of these ant colonies contained winged adults and pupae. On 9-10 Feb, after learning of the PPDC determination of the ants as RIFA, all the bee colonies in the orchard were assembled and the bees transferred to clean hives. The RIFA infested hives were then sprayed with an aerosol insecticide prior to being fumigated with Phostoxin. Windy conditions necessitated a second Phostoxin treatment of some of the hives on 12 Feb. On 15 Feb, the treated hives were reinspected and taken out of California.

To facilitate future follow-up surveys of the orchard for RIFA, the position of each hive was noted using a global positioning system while assembling the hives for fumigation,. These surveys were conducted by CDFA and Kern County Agricultural Commissioner personnel during the spring, summer and fall of 1997. Three foraging worker RIFA were found on 22 Oct mixed in a composite sample composed mostly of specimens of *Solenopsis xyloni* McCook. Subsequent visual surveys of the orchard found 18 RIFA colonies scattered at the edge of the orchard and along several roads through the orchard. Several of these were substantial in size, 20 to 24 cm in diameter, and had winged alates.

RIFA has two colony types: monogyne which reproduce through flights of winged reproductives and polygyne which depend less on alate flight and more on colony fission to reproduce (Vinson, S. B. 1994. pp. 240-258. In D. F. Williams (ed.). Exotic ants: biology, impact and control of introduced species). Because colony type has an influence on the size of the RIFA survey to be conducted, samples of several dozen minors each, of the first three RIFA holes discovered (assumed to represent a single colony because of their restriction to a 0.6 by 0.6 m area), were sent to Ken Ross' laboratory, at the University of Georgia, Athens Georgia to determine whether they were monogyne or polygyne. There, Ross' student, Chris DeHeer, ran three tests on the samples to determine their reproductive type.

The first test, size, found that the workers were small, which is consistent with polygyny. However, small individual size potentially also might indicate a relatively newly established monogyne colony in which resources were being placed into increasing ant numbers. The second test, familial structure, which assessed the maternal parentage of each worker, was consistent with all tested workers being produced by a single queen. Although this might also indicate monogyny, this test would be biased in favor of a single maternal lineage if the nest was relatively new (i.e. multiple queens had not yet had a chance to become reproductive). A familial structure test also depends upon a random sample (through nest digging), but all workers for these samples were collected on the surface near the entrance holes, and thus were not a random sample of the population. A third test, isozyme analysis, found that all three samples showed the presence of an gene product marker (unknown function) that has thus far been associated only with polygyne colonies. Ross' lab has found this marker to be associated only with polygyne populations with several hundred of each type of colony tested. The determination is, therefore, that the nest tested is polygyne. We believe that it is a relatively new nest, with the sampled workers produced by a single queen.

CDFA, in collaboration with Kern County Agricultural Commissioner and the United States Department of Agriculture, is conducting an eradication program against this RIFA infestation. The eradication program plan includes 1) insecticide drenches of RIFA nests to reduce a) the number of ants in the colony and b) possibility of dispersal by alates (Collins, H. L. & A. A. Callcott. 1995. J. Entomol. Sci. 30:489-496), and 2) a series of treatments with an insect growth regulator to render the queens sterile (Collins, H. L., A. Callcott, T. C. Lockley & A. Ladner. 1992. J. Econ. Entomol. 85:2131-2137). Delimitation surveys of the orchard and the surrounding area for more RIFA colonies will continue and post-treatment surveys of the treated nests will determine the success of the eradication treatments.

Red Imported Fire Ant, a report by the editor

History

The red imported fire ant, *S. invicta*,was originally introduced from South America at the port of Mobile, AL, sometime between 1918 and 1945, although most reports indicate it didn't come to the U.S. until sometime between 1930 and 1945. The first official survey in 1953, by the USDA, showed that it had spread rapidly into 10 states. Today it has spread into Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Puerto Rico. RIFA has restricted the spread and range of the black imported fire ant, *S. richteri*, imported in 1918. It has also replaced two native species, the tropical fire ant, *Solenopsis geminata* Fabricius, and the southern fire ant, *S. xyloni* McCook. A federal quarantine was enacted in 1958 to aid in preventing the spread of fire ants. Still in effect today, the quarantine prevents the movement into uninfested areas of hay, sod, soils, used soil-moving equipment, potted plants and other plants with soil attached.

Identification

Dr. William Buren partially clarified the taxonomy of *Solenopsis* in South and North America, in 1972. He showed that two species of imported fire ants were present in the United States. Identification of *Solenopsis* to the species level is made more difficult by the hybridization between the two imported fire ant species as well as between imported fire ants and the two species native to the United States. The major feature for identifying *Solenopsis* is the 10 segmented antennae with a two segmented club. Other features include the stinger, a two segmented pedicel and an unarmed propodeum.

Other distinguishing features include hairs, coloration, and nest mounds. Major workers of the species S. *geminata* and *S. xyloni* , in general, have more erect hairs than *S. invicta*. Mounds of *S. invicta* are often higher and more conical than those of other species, but soil type and moisture conditions cause considerable variation in mound shapes. All three species have a wide range of coloration, but in general S. *invicta* ranges from reddish brown to dark brown; it has been called the "intermediate browns" by those who believe the color form represents hybrids between *S. invicta* and *S. richteri*. However, since the range overlap of the two species is small, and the dark variations occur throughout the known ranges in both the U.S. and South America, hybridization can't explain the variations in color. *S. geminata* ranges in color from red to black while *S. xyloni* can range from yellow to reddish brown.

Generalized morphological key to the common US fire ants (*Solenopsis*)*

1. Petiole with 2 nodes; antenna 10-segmented, with a very distinct 2-segmented apical club (Fig. 8A,B,E; clypeus with 2 longitudinal ridges or keels which extend forward into teeth (Fig. 8A,B); propodeum without spines or teeth (Fig. 8C). . . . . .(genus *Solenopsis*) **2**
   Without above combination of characters . . . . . **.other ants**

2. Usually larger ants, 1.6-6 mm; second and third funicular joints of antennae at least 1 1/2 times longer than broad . . . . . (subgenus *Solenopsis*) **3**
   Smaller ants, 1.5-2.2 mm; second and third funicular joints of antennae broader than long . . . . . subgenera ***Euophthalma*** and ***Diplorhoptrum***

3. Majors with disproportionately large head, the occipital lobes pronounced (Fig. 8D); all size workers with elevated carinae (ridges) on either side of the basal face of the propodeum; mesopleural flange broken into various projections; medial clypeal tooth absent . . . . . **.*S.geminata***
   Majors with medium sized head with the occipital lobes only moderately enlarged; all size workers without elevated carinae on basal face of propodeum; mesopleural flange entire or absent, not broken into jagged projections; medial clypeal tooth present or absent **4**

4. Petiole usually with distinct antero-ventral tooth (Fig. 8C); mesopleuron finely sculptured; medial clypeal tooth absent; in major, antennal scapes extending half way between point of insertion and occipital lobes. . . . . **.*S.xyloni***
   Petiole usually without a distinct tooth, at most a slight knob present (as in fig. 2) mesopleuron densely sculptured; medial clypeal tooth usually present ((Fig. 8A,B); in major, antennal scape nearly reaching occipital lobe. . . . . **.*S. invicta***

*Key adapted from: The Fire Ants (*Solenopsis*) of Florida (Hymenoptera: Formicidae). D.P. Wojcik, W.F. Buren, E.E. Grissell, and T. Carlysle. Florida Department of Agriculture Entomology Circular No. 173. November 1976.

Biology

Fire ant colonies are made up of eggs, brood, polymorphic workers, winged males, winged females and one or more reproductive queens. Age of the sterile workers determines how labor is divided up in the colony. Care for the developing brood is assigned to younger workers; colony maintenance and protection is provided by the middle-age workers and food collection is done by the eldest workers.

A mature colony consists of 100,000 to 500,000 workers and several hundred "reproductives". Reproductives, also known as alates, are winged males and females that accumulate in the colony until weather conditions are favorable, usually late spring and early summer, for mating flights. After mating, the male dies after falling to the ground; if the female (queen) lands on suitable ground, she will remove her wings and excavate a small chamber in the soil, becoming the new queen. Egg laying will begin within 24 hours. Only 10-15 eggs will be laid,

which she will then care for until they develop into worker ants . These first worker ants will then do all the caring for eggs laid after this as well as all the tasks related to maintaining the colony. The queen's only function is to lay eggs. If fire ant queens survive the first few months after mating, they may live as long as six or seven years. Mortality of fire ant queens during the first few months is often as high as 99%. Workers have a much shorter life span, usually several months.

Fire ant mounds are distinctive and can be used to identify imported fire ant colonies. The mounds may be as high as 60 cm and have a diameter of 60 cm at the base. Often built in open sunny areas,they are sometimes supported by a human structure or a shrub. The mounds don't have a central opening into the colony, but do have an extensive array of tunnels that allow access to the interior. The network of tunnels conveys sounds to the colony and may reach as much as five feet or more below the soil surface.

Economic Importance

The venom injected by a RIFA sting causes fiery itching or an extreme burning sensation, and pustules; severe reactions can bring on anaphylactic shock and even death. With intense scratching, pustules can become infected. Mounds located in lawns, pastures, roadsides and farm fields can cause many difficulties for people and livestock. RIFA can cause economic losses in harvesting hay, soybeans, etc., deaths of young livestock and gamebirds and the cost of treating infested areas. Deer and ground nesting species such as bobwhites and rodents are also affected by RIFA. One positive benefit of RIFA occurs in cotton and sugar cane fields, where they feed on lepidopteran larvae. RIFA can aid cattle ranchers because they feed on susceptible stages of ticks & fleas that affect cattle.

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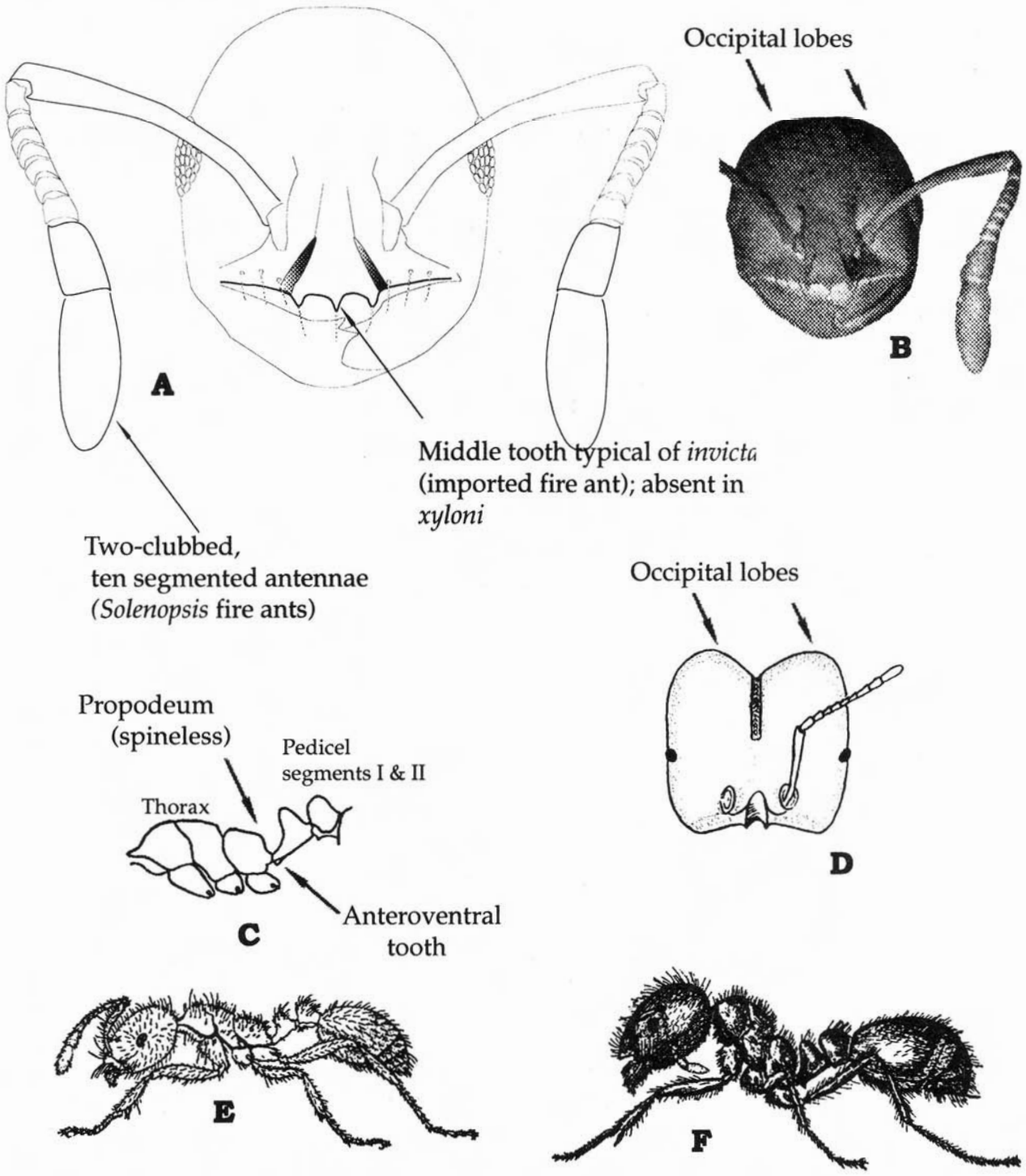

Fig. 8. Comparisons of *Solenopsis* fire ants. A:Frontal view of head of *S. invicta*, redrawn from photo in B; B: partial frontal SEM photo of *S. invicta*; C: lateral view of thorax and pedicel of *S. xyloni*; D: frontal view of head of *S. geminata* showing occipital lobes; E: lateral view of worker of *S. xyloni*; F: lateral view of soldier of *S. xyloni*. Photo in "B" taken from Wojcik et al in Florida Depart.Entomol. Circ. 173, 1976. Figures 8C through 8F adapted from W. Cook. 1953, The Ants of California. Pacific Books, Palo Alto, CA. 462 pp.

NEW COUNTY RECORDS

CLOUDYWINGED WHITEFLY, *Dialeurodes citrifolii* -(Q)- This whitefly was collected for the first time in **Santa Barbara** County. The collection was made at Goleta on September 3 from *Citrus sinensis* by Rajala. For more information on this pest see CPPDR 1985, 4(2):53-55). It also occurs in San Diego, Orange and Los Angeles Counties.

EXCLUSION

Several pest species are collected every year in nurseries or other similar situations that are not necessarily considered to be established in the state. Nurseries are required to be free of all pests with these ratings ("A," "Q" or "B"). Following are some examples of rated pests found in nurseries between June and December.

PALM MEALYBUG, *Palmicultor palmarum* -(Q)- Found in a nursery in Oxnard, Ventura County on triangle palm by Kragh on July 17.

TWOSPOTTED LEAFHOPPER, *Sophonia rufofascia*, -(Q)- Found in a nursery in San Gabriel, Los Angeles County on *Magnolia* by Humphries on July 22. Also in Los Angeles County, it was collected from a nursery in Los Angeles on Eugenia by Sium on September 19. This leafhopper is established in southern California.

A BARK BEETLE, *Pagiocerus frontalis* -(Q)- Found on oranges and bananas at a grocery store in San Leandro, Alameda County. The sample was submitted to the Agricultural Commissioner's office for identification.

A LONGHORNED BEETLE, *Trichoferus* sp. -(Q)- Found on wood crates originating in China. The collection was made by Hanes at Oxnard, Ventura County in July.

JASMINE WHITEFLY, *Aleuroclava jasmini* -(Q)- Found on *Gardenia jasminoides* at a nursery in Santa Ana, Orange County on November 25 by Sanford. Other collections, also in Orange County, were made on November 17 at Trabuco Canyon and at Stanton on November 18 by Nestor. This whitefly is established in California.

A MEALYBUG, *Nipaecoccus* sp. -(Q)- Found on palms and *Eugenia* at a nursery in Montclair, Los Angeles Country on August 6 by Sium.

MAGNOLIA WHITE SCALE, *Pseudaulacaspis cockerelli* -(A)- This scale insect pest of palms and other ornamentals has been collected from a nursery in La Puente, Los Angeles County. The collection was made on December 17 by Calicchia and Cartana from *Trachycarpus fortunei* and *Phoenix roebelenii*.

The lists on the following three pages cover the pests that were intercepted in quarantine for the months of June through December.

"A", "B", and "Q" Rated Arthropods and Mollusks Intercepted in Quarantine June 1997 - December1997

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
A	*Anastrepha* sp.	exotic fruitfly	1/10	Puerto Rico	LAX	fruit	Nolan
Q	*Coccus acutissimus*	slender soft scale	4/22	Hawaii	LAX	*Cycas revoluta*	Hamashita
Q	*Crenidorsum* sp.	whitefly	4/18	Hawaii	SBA	*Philodendron* sp.	Davis
Q	*Rhizoecus hibisci*	root mealybug	4/22	Florida	ORA	*Ravenea ribularis*	Fernendez
A	*Unaspis citri*	citrus snow scale	5/16	Florida	ORA	*Citrus paradisi*	Dayyani
A	*Selenothrips rubrocinctus*	redbanded thrips	9/16	Hawaii	SFO	Tropical plants	Wion
B	*Pulvinaria psidii*	green shield scale	5/16	Hawaii	SFO	Tropical plants	Wion
Q	*Greenidea formosana*	an aphid	9/16	Hawaii	SFO	Tropical plants	Wion
A	*Clavaspis herculeana*	herculeana scale	5/15	Hawaii	ORA	*Plumeria* sp.	Wynn
Q	*Diaspidiotus cystallinus*	iron wood scale	5/2	Louisiana	SFO	*Quercus* sp.	Wion
Q	*Chryptophlebia illepida*	macadamia nut borer	5/22	Hawaii	BUT	*Macadamia* sp.	Ewing
Q	*Pheidole megacephala*	bigheaded ant	5/27	Hawaii	LAX	*Melangai*	Chinwah
A	*Coccus viridis*	green scale	5/30	Hawaii	SMT	*Zingiber* sp.	Garibaldi
Q	*Pseudaulacaspis major*	lychee bark scale	5/20	Florida	SMT	*Litchi chinensis*	Garibaldi
Q	*Orchamoplatus mammaeferus*	croton whitefly	6/6	Hawaii	SFO	?	Wion
Q	*Aleurocerus palmae*	palm whitefly	5/22	Mexico	SAC	Tepe	Dixon
Q	*Trichoferus campestris*	a longhorned beetle	6/16	China	VEN	Wood pallet	Alamillo/Hanes
A	*Parlatoria proteus*	sansevieria scale	6/12	Guatemala	SJQ	*Dracaena sandrana*	Pelletier
B	*Ferrisia virgata*	striped mealybug	6/12	Costa Rica	SJQ	*Dracaena marginata*	Lanchester
Q	*Anoplolepis longipes*	longlegged ant	6/16	Hawaii	SFO	*Zingiber* sp.	Olmsted
B	*Pseudococcus elisae*	elisa mealybug	6/13	Florida	SMT	*Litchi chinensis*	Loux
B	*Ferrisia virgata*	striped mealybug	6/13	Florida	SMT	*Litchi chinensis*	Loux
Q	*Coccus acutissimus*	slender soft scale	6/13	Florida	SMT	*Litchi chinensis*	Loux
Q	*Hemiberlesia diffinis*	diffinis scale	6/12	Florida	ORA	*Ficus benjamina*	Wynn
Q	*Orchamoplatus mammaeferis*	croton whitefly	6/25	Hawaii	ORA	*Alyxia olivaeformis*	Fernandez
A	*Coccus viridis*	green scale	6/2	Hawaii	SMT	*Musa* sp.	Garibaldi
A	*Ceroplastes rubens*	red wax scale	6/25	Hawaii	ORA	*Alyxia olivaeformis*	Fernandez
A	*Coccus viridis*	green scale	6/17	Hawaii	SFO	*Musa* sp.	Loux
A	*Adoretus sinicus*	Chinese rose beetle	7/8	?	ALA	Aircraft	Franke
Q	*Trichoferus* sp.	a longhorned beetle	?	China	VEN	Wood pallet	Alamillo
Q	*Gelechiidae*	a gelechiid moth	?	Viet nam	ALA	?	Curry
Q	*Cecidomyiidae*	a gall midge	7/11	New Zealand	SP	*Malus* sp.	Azhar
B	*Pseudococcus elisae*	elisa mealybug	7/9	Hawaii	ORA	*Heliconia* sp.	Ellis
Q	*Magicicada*sp.	a periodical cicada	6/24	Iowa	LAX	*Aircraft*	Rojas
A	*Coccus viridis*	green scale	7/9	Hawaii	LAX	*Chamaedorea seifrizii*	Humphreys
Q	*Conopomorpha* sp.	a gracillariid moth	7/12	British Columbia	HO	*Litchi chinensis*	Reith
Q	*Conopomorpha* sp.	a gracillariid moth	7/31	Taiwan	HO	*Litchi chinensis*	Baker
Q	*Dyscinetus* sp.	a scarab beetle	7/17	Guatemala	LAX	Aircraft	Winningham
Q	*Milviscutulus mangiferae*	mango shield scale	7/9	Florida	ORA	*Mangifera indica*	Park

"A", "B", and "Q" Rated Arthropods and Mollusks Intercepted in Quarantine June 1997 - December 1997

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
Q	*Coccus acutissimus*	slender soft scale	7/9	Florida	ORA	*Litchi chinensis*	Park
Q	*Dyscinetus morator*	a scarab beetle	7/16	?	ALA	Aircraft	Speakman
Q	*Palmicultor palmarum*	palm mealybug	7/23	Hawaii	SJQ	Tuya palm	Pelletier
Q	*Orchidophilus* sp.	a weevil	7/21	Hawaii	ALA	Tropical foliage	Peek
A	*Lymantria dispar*	gypsy moth	8/14	New York	SCR	Gym set	Morton
A	*Lymantria dispar*	gypsy moth	8/14	New York	SCR	Gym set	Morton
B	*Lepidosaphes beckii*	purple scale	8/22	Argentina	SFO	*Citrus sinensis*	Olmsted
Q	*Eriophyes annonae*	an erophyid mite	8/5	Puerto Rico	SFO	*Annona* sp.	Wion
A	*Anomala orientalis*	Oriental beetle	8/11	Tennessee	LAX	Aircraft	Sauber
A	*Adoretus sinicus*	Chinese rose beetle	8/18	Hawaii	SFO	Pick-up trk/debris	Clifford
Q	*Rhizoecus hibisci*	a root mealybug	8/26	Florida	LAX	*Ravenea rivularis*	Sium
Q	*Ochetellus glaber*	an ant	8/26	Hawaii	ORA	*Ananas comosus*	Kinsella
Q	*Pseudococcus solenedyos*	a mealybug	9/3	Guatemala	SLO	*Pothos* sp.	Cairns
A	*Orgyia leucostigma*	whitemarked tussock moth	7/29	New York	SCL	Trash can	Clement
A	*Protaetia orientalis*	a scarab beetle	8/12	Tennessee	LAX	Aircraft	Sauber
A	*Rhizotrogus majalis*	European chafer	8/14	Tennessee	LAX	Aircraft	Rojas
Q	*Proxys punctulatus*	a stinkbug	8/12	Ohio	LAX	Aircraft	Rojas
A	*Solenopsis invicta*	red imported fire ant	8/20	Texas	ORA	Truck trailer	Wynn
A	*Rhizotrogus majalis*	European chafer	8/27	Tennessee	ALA	Aircraft	Speakman
Q	*Dreissena polymorpha*	zebra mussel	9/16	Illinois	CCA	Sailboat	Fonseca
Q	*Rhizotrogus* sp.	a scarab beetle	8/4	Utah	ALA	Aircraft	Speakman
A	*Popillia japonica*	Japanese beetle	8/1	?	ALA	Aircraft	Chin/Franke
A	*Popillia japonica*	Japanese beetle	8/13	Texas	ALA	Aircraft	Speakman
A	*Popillia japonica*	Japanese beetle	8/3	Indiana	ALA	Aircraft	Franke
A	*Popillia japonica*	Japanese beetle	7/31	Pennsylvania	ALA	Aircraft	Speakman
A	*Popillia japonica*	Japanese beetle	7/31	Indiana	ALA	Aircraft	Chin
A	*Maladera castanea*	Asiatic garden beetle	7/30	So. Carolina	ALA	Aircraft	Franke
A	*Maladera castanea*	Asiatic garden beetle	9/10	?	ALA	Aircraft	Speakman
A	*Bactrocera zonatus*	peach fruit fly	9/25	?	ALA	Jackson trap-peach	Cutler
A	*Aspidiotus destructor*	coconut scale	10/7	Ecuador	LAX	*Musa* sp.	Lawrence
Q	*Camponotus abdom. floridanus*	Florida carpenter ant	10/7	Florida	LAX	*Spathiphyllum* sp.	Humphrey
B	*Rhagoletis pomonella*	apple maggot	10/4	New Jersery	LAX	*Malus* sp.	Hernandez
A	*Parlatoria blanchardi*	parlatoria date scale	10/6	New York	LAX	Palm	Newal
B	*Siphanta acuta*	torpedo bug	7/31	Hawaii	LAX	Cut Flowers	Hartman
Q	*Rhizoecus hibisci*	a root mealybug	8/2	Hawaii	LAX	*Zingiber* sp.	Bakri
Q	*Coptosoma xanthogramma*	black stink bug	7/28	Hawaii	LAX	Malangai	Chinwah
Q	*Conopomorpha* sp.	a gracillariid moth	8/1	China	SP	*Litchi chinensis*	Lawrence
B	*Lamellaxis* sp.	a snail	8/26	Florida	LAX	*Phoenix roebelenii*	Humphreys
Q	*Geococcus coffeae*	a soil mealybug	8/29	Hawaii	LAX	*Chamaedorea seifrizii*	Kellum

"A", "B", and "Q" Rated Arthropods and Mollusks Intercepted in Quarantine June 1997 - December1997

Rating	Species	Common Name	Date	Origin	County	Host	Collector(s)
B	*Ferrisia virgata*	striped mealybug	9/10	Florida	LAX	*Dracaena cincta*	Kellum
A	*Aspidiotus destructor*	coconut scale	?	Ecuador	LAX	*Musa* sp.	Lawrence
Q	*Lapara coniferarum*	a sphinx moth	8/22	Tennessee	LAX	Aircraft	Oliver
B	*Ferrisia virgata*	striped mealybug	9/30	Florida	ORA	*Mandevilla* sp.	Wynn
A	*Anastrepha obliqua*	West Indian fruit fly	8/26	Puerto Rico	KRN	Mango/avocado	Holland/Sithole
Q	*Philephedra tuberculosa*	a soft scale	10/6	Puerto Rico	SJQ	*Croton petra*	Lanchester
Q	*Philephedra tuberculosa*	a soft scale	10/8	Puerto Rico	SJQ	*Croton petra*	Pelletier
B	*Rhagoletis pomonella*	apple maggot	9/8	Pennsylvania	ORA	*Malus* sp.	Tiffer
Q	*Aleurocerus palmae*	palm whitefly	9/8	Florida	SAC	Tepe leaves	Hightower
Q	*Retithrips syriacus*	black vine thrips	8/5	Puerto Rico	SFO	Plant material	Wion
Q	*Prosapis* sp.	a spittlebug	8/5	Indiana	SAC	Aircraft	Weiner
Q	*Platyptillia* sp.	a plume moth	8/5	Puerto Rico	SFO	Plant parts	Wion
A	*Parlatoria proteus*	sansevieria scale	9/24	Hawaii	SJQ	*Schefflera* sp.	Lanchester
Q	*Paraleucoptera* sp.	a lyonetiid moth	8/5	Mexico	SAC	Tepe Leaves	Hightower
Q	*Palmicultor palmarum*	palm mealybug	8/12	Hawaii	SJQ	Triangle palm	Pelletier
A	*Chrysodeixis eriosoma*	green garden looper	9/11	Hawaii	SJQ	Tea leaves	Pelletier
Q	*Aleurocerus palmae*	palm whitefly	8/5	Mexico	SAC	Tepe leaves	Hightower
A	*Adoretus sinicus*	Chinese rose beetle	8/14	Hawaii	SAC	Tropical flowers/foliage	Bianchi
A	*Acutaspis albopicta*	albopicta scale	9/24	Costa Rica	SJQ	*Aglaonema* sp.	Lanchester
Q	*Oncometopia* sp.	a leafhopper	8/21	Indiana	SAC	Aircraft	Weiner
B	*Aonidiella aurantii*	California red scale	8/20	South Africa	SFO	*Citrus paradisi*	Clifford
Q	*Rhamphothrips pandens*	a thrips	8/5	Puerto Rico	SFO	Plant material	Sohal
Q	*Philomycus* sp.	a slug	8/22	Hawaii	ORA	*Dracaena warneckii*	Wynn
A	*Morganella longispina*	plumose scale	8/26	Florida	ORA	*Ficus benjamina*	Bennett
A	*Howardia biclavis*	mining scale	8/4	Florida	ORA	*Ficus benjamina*	Fernandez
Q	*Homalodisca* sp.	a leafhopper	9/17	Costa Rica	SJQ	*Dracaena marginata*	Lanchester
B	*Ferrisia virgata*	striped mealybug	8/26	Florida	ORA	*Nephrolepis* sp.	Bennett
B	*Ferrisia virgata*	striped mealybug	8/26	Florida	ORA	*Croton* sp.	Bennett
Q	*Eriophyes annonae*	an eriophyid mite	8/5	Puerto Rico	SFO	Plant material	Sohal
B	*Aonidiella aurantii*	California red scale	8/22	South Africa	SFO	*Citrus sinensis*	Clifford
Q	*Andaspis leucophleae*	a diaspidid scale	8/26	Florida	ORA	*Ficus benjamina*	Bennett
A	*Acutaspis albopicta*	albopicta scale	8/21	Guatemala	SJQ	?	Pelletier
Q	*Coccus acutissimus*	slender soft scale	9/16	Florida	ORA	*Dimocarpus longan*	Park
B	*Pseudococcus elisae*	elisa mealybug	10/1	Costa Rica	SLO	*Schefflera arbicola*	Cairns
A	*Hemiberlesia palmae*	tropical palm scale	8/26	Florida	SON	Bromeliads	Vernon
A	*Diocalandra* sp.	a weevil	9/23	Hawaii	SLO	*Cocos nucifera*	Groat
B	*Unaspis euonymi*	euonymous scale	9/19	North Carolina	SMT	Bittersweet	Loux
A	*Orgyia leucostigma*	whitemarked tussock moth	8/26	Pennsylvania	SCL	Doghouse	Clement
Q	*Pinnaspis uniloba*	unilobed scale	9/5	Hawaii	SMT	*Alyxia olivaeformis*	Loux

SIGNIFICANT FINDS OTHER STATES

THRIPS: Two thrips species have been collected in Florida for the first time. The following information is an extraction of information in a report on these thrips by Steve Nakahara, thrips expert at the USDA Systematic Entomology Laboratory in Beltsville, Maryland:

One specimen of *Neohydatothrips inversus* (Hood) and many specimens of *Anascirtothrips arorai* Bhatti (tentative determination due to minor morphological variations from previously identified material) were found on *Ficus* rootstocks at Homestead, Florida on November 13, 1997. These are new Florida and United States records. Subsequent surveys found more *Anascirtothrips arorai* on *Ficus* plants and hedges around the Homestead area. *Neohydatothrips inversus* is a Neotropical species reported from several hosts. The genus *Anascirtothrips* contains two species (*arorai* and *ficus*), and occurs in Southeast Asia and India were it is commonly collected from *Ficus* and *Psidium* (guava). This is a new Western Hemispere record for this species.

The genus *Anascirtothrips* has numerous microtrichia (characters as seen on slide mounted specimens) like *Scirtothrips* and *Neohydatothrips*, but differs in having 7-segmented antennae, stout forked sense cones on antennal segments III and IV; head with three pairs of of ocellar setae; pronotal posteromarginal setae subequal in length; mesonotum with two pairs of well developed setae anterior of the posterior margin oriented transversely; forewings with intermittent setae on distal 1/2 of forevein; and abdominal sternite VII with psteromarginal setae on posterior margin. For more information on this thrips see Bhatti, J.S., 1961: Bull. Entomol. 2:26-29.

Neohydatothrips inversus is known from Costa Rica, Panama, Trinidad, and Puerto Rico. It is listed from *Andira inermis*, *Cajanus*, and *Coursetia arorea*. This species is unique in the genus in having the median mesonotal setae usually arising in a straight line with the lateral pair. For further information on this thrips see Mound, L.A. and R. Marullo, 1996: The Thrips of Central and South America: An Introduction. 487 pp.

The economic importance of either thrips is apparently slight, the damage usually is found primarily on young foliage.

ASIATIC LONGHORNED BEETLE, *Anoplophora glabripennis* -- This Cerambycid beetle has been found established in the Greenpoint district of Brooklyn, New York, where it is severely damaging Norway maple and horsechestnut trees. The beetle is native to Japan, Korea and southern China. The beetles lay eggs in crevices in the bark; larvae hatch and bore into the inner bark, then later tunnel into the heart wood. Pupation occurs in the spring with emergence in early summer. The maples are the most commonly planted shade trees in New York state, but those growing in the city environments are often stressed for other reasons, making them more susceptible to beetle attacks. The beetles are about one inch long, black with numerous white or cream-colored spots and with antennae longer than the body. This beetle was intercepted in quarantine on wooden pallets at San Luis Obispo originating in China.

Anoplophora glabripennis

Border Stations

"A", "B", and "Q" Rated Arthropods and Mollusks Intercepted June 1997 - December 1997

Pest	Station	Date	Origin	Collector	Host
citrus leafminer - *Phyllocnistis citrella*	BL	7/5	Florida	Rincon	Tangelo trees
a mite - *Tydeus* sp.	BL	7/5	Florida	Rincon	Leaves
cloudywinged whitefly - *Dialeurodes citrifolii*	BL	7/5	Florida	Rincon	Leaves
gypsy moth - *Lymantria dispar*	LV	6/10	Pennsylvania	Keller	RV
vanda orchid scale - *Genaparlatoria pseudaspidiotus*	HO	5/25	Oregon	Whitman	*Mangifera indica*
Southwestern corn borer - *Diatraea grandiosella*	NE	7/10	Missouri	Bryant	*Zea mays*
eastern cherry fruit fly - *Rhagoletis cingulata*	SM	7/9	Idaho	Oneto	*Prunus avium*
trilobe scale - *Pseudaonidia trilobitiformis*	BL	7/29	Grenada	Klingenmeier	June plum
Pacific mealybug - *Planococcus minor*	BL	7/29	Grenada	Klingenmeier	June plum
Oriental fruit fly - *Bactrocera dorsalis*	HO	7/25	Washington	Lacy, Jr.	*Litchi chinensis*
Oriental fruit fly - *Bactrocera dorsalis*	HO	7/25	Taiwan/KY	Whitman	*Litchi chinensis*
an armored scale - *Aulacaspis tubercularis*	VI	6/5	Mexico	Duitsman	*Mangifera indica*
longan scale - *Thysanofiorinia nephelii*	HO	7/7	British Columbia	Pastell	*Litchi chinensis*
longan scale - *Thysanofiorinia nephelii*	HO	7/7	Washington	Pastell	*Euphoria longan*
black thread scale - *Ischnaspis longirostris*	HO	7/7	Oregon	Whitman	*Mangifera indica*
striped cucumber beetle - *Acalymma vittatum*	VI	7/29	No. Carolina	Granger	Trailer
a Plusiine looper - *Rachiplusia ou*	VI	9/2	Honoduras	Granger	Trailer
European corn borer - *Ostrinia nubilalis*	LO	9/10	Nebraska	Doyle	*Zea mays*
gypsy moth - *Lymantria dispar*	SM	8/29	Pennsylvania	Austin	RV
gypsy moth - *Lymantria dispar*	RH	9/2	New Jersey	Blakely	Trailer chassis
gypsy moth - *Lymantria dispar*	SM	9/5	Ontario	Brear	Motorhome
twolined spittlebug - *Prosapia bicincta*	VI	8/26	Louisiana	Granger	Trailer
bigheaded ant - *Pheidole megacephala*	NE	8/20	Florida	Hollars	Trailer - inside
European corn borer - *Ostrinia nubilalis*	YE	8/14	Iowa	Khall	*Zea mays*
gypsy moth - *Lymantria dispar*	LV	9/12	Massachusetts	Keller	RV compartment
gypsy moth - *Lymantria dispar*	LV	9/19	Michigan	Hamblet	Spare tire
zebra mussel - *Dreissena polymorpha*	TR	9/15	Illinois	Baldridge	Sailboat -top rudder
a Gracillariid moth - *Conopomorpha* sp.	HO	8/29	British Columbia	Lewis	*Euphoria longan*
Florida carpenter ant - *Camponotus abdom.-floridanus*	VI	9/16	Florida	Gresick	Trailer
Florida carpenter ant - *Camponotus abdom.-floridanus*	BL	9/14	Florida	Deleon	Nursery stock
a fruitworm beetle - *Byturus* sp.	LV	7/29	Montana	Sheppard	*Rubus* sp.
garden bagworm - *Apterona helix*	TR	8/6	Michigan	Goodman	Trailer

(continued)

Border Stations

Pest	Station	Date	Origin	Collector	Host
Oriental scale - *Aonidiella orientalis*	SM	9/1	Florida	Brear	*Cocos nucifera*
Oriental scale - *Aonidiella orientalis*	NE	3/16	Mexico	Kimball	*Cocos nucifera*
arrowhead scale - *Unaspis yanonensis*	SM	8/4	British Columbia	Brear	*Citrus reticulata*
European corn borer - *Ostrinia nubilalis*	NE	9/21	Minnesota	Bryant	*Zea mays*
European corn borer - *Ostrinia nubilalis*	TR	9/19	Illinois	Morrow	*Capsicum annuum*
Mexican bean beetle - *Epilachna varivestis*	NE	9/24	Arkansas	Hollars	Plants
pecan weevil - *Curculio caryae*	LV	10/11	Florida	Doyle	*Carya illinoinensis*
arrowhead scale - *Unaspis yanonensis*	HO	1/13	Oregon	McFall	*Citrus* sp.
arrowhead scale - *Unaspis yanonensis*	SM	1/7	British Columbia	Villarreal	*Citrus* sp.
vanda orchid scale - - *Genaparlatoria pseudaspidiotus*	HO	8/16	Washington	Rooker	*Mangifera indica*
vanda orchid scale - - *Genaparlatoria pseudaspidiotus*	HO	8/31	?	Middleton	*Mangifera indica*
vanda orchid scale - - *Genaparlatoria pseudaspidiotus*	HO	8/3	Oregon	Rooker	*Mangifera indica*
boll weevil - *Anthonomus grandis*	NE	9/30	Oklahoma	Cline	*Gossypium* sp.
Japanese beetle - *Popillia japonica*	LO	8/20	New York	Doyle	Plastic chock blocks
European corn borer - *Ostrinia nubilalis*	TR	8/24	South Dakota	Knutila	*Zea mays*
gypsy moth - *Lymantria dispar*	BL	8/22	New York	Klingenmeier	Mower wheel
an ant - *Monomorium* sp.	BL	10/3	Texas	Vasquez	*Citullus vulgaris*
a gracilariid moth - *Marmara* sp.	DO	9/27	Oregon	Garrison	*Citrus sinensis*
gypsy moth - *Lymantria dispar*	DO	9/17	Connecticut	Wood	Doghouse
sugarcane beetle - -*Euetheola humilis rugiceps*	LV	9/28	Arkansas	Hamblet	Utility trailer
European corn borer - *Ostrinia nubilalis*	NE	10/15	Illinois	Dollins	*Zea mays*
European corn borer - *Ostrinia nublilais*	NE	10/21	Illinois	Derichsweiler	*Zea mays*
gypsy moth - *Lymantria dispar*	NE	10/15	Connecticut	Cline	Automobile dolley
gypsy moth - *Lymantria dispar*	WI	10/7	New Hampshire	Hinsley	Camper trailer
gypsy moth - *Lymantria dispar*	HO	10/22	Pennsylvania	Whitman	Trailer frame
hickory Shuckworm - *Cydia caryana*	NE	10/19	Louisiana	Derichsweiler	*Carya illinoinensis*
a weevil - *Conotrachelus* sp.	VI	10/15	Arizona	Granger	Trailer
striped mealybug - *Ferrisia virgata*	VI	12/11	Florida	Duitsman	Nursery stock
zebra mussel - *Dreissena polymorpha*	TR	9/3	Michigan	Rudolph	Yacht trim tabs

Key to station locations: AL-Alturas, BE-Benton, BL-Blythe, DO-Dorris, HO-Hornbrook, LO-Long Valley, ME-Meyers, NE-Needles, RE-Redwood Highway, SM-Smith River, TO-Topaz, TR-Truckee, TU-Tulelake, VI-Vidal, WI-Winterhaven, YE-Yermo.

PLANT PATHOLOGY HIGHLIGHTS

Bacterial Canker of Tomato

by

Dan Opgenorth
PPDB Plant Bacteriologist

This past August several unusual samples of fresh tomatoes arrived at our laboratory. The samples originated in southern Sacramento, Yolo, San Joaquin, and Placer Counties involving approximately 2,000 acres. Plants were wilting and not growing as well as would be expected. A discoloration was present in the vascular system which normally would mean involvement of the common *Fusarium* or *Verticillium* wilts. However, closer examination showed that the pith was discolored and open lesions were present. These symptoms are not typical of the more common vascular wilt diseases. After culture on YDC media, a mustard yellow, smooth and glistening, gram positive bacteria was isolated. This confirmed the presence of Bacterial Canker which is one of the less frequently found tomato diseases in California.

The disease was first described in 1909 by Erwin F. Smith from tomatoes growing in a greenhouse at Grand Rapids, Michigan. It was first called "Grand Rapids Disease" but later renamed Bacterial Canker. *Clavibacter michiganensis*, the bacteria responsible for the disease, can be carried in the seed or on the seed coat and can persist in the soil for up to three years. As seeds germinate the young cotyledons are forced above ground and then become infected through their stomata. Contaminated soil, old plant parts or equipment containing bacteria can also provide inoculum for primary infection. The seedling becomes infected and grows while the bacteria systemically infect the phloem. As the plant develops, the cortex and pith also become involved and leaves on one side usually wilt. With extensive involvement of cortex and pith, open wounds or cavities form which give rise to the common name of bacterial canker. The bacteria can continue to move systemically and invade the fruit and the seeds. Secondary infection can result from bacterial inoculum oozing out of the cankers and moving by irrigation or rain onto leaves, stems or fruit of healthy plants. On green fruits, the infection initially appears to be a small water soaked spot with a white halo and eventually progresses to a 2 mm tan or brown blister-like lesion.

Since the disease is commonly seed borne it can be controlled by the use of clean seed or treated seed. Fermentation of seed in the pulp and juice at temperatures of 70°F or greater for 72 hours is believed to eliminate the pathogen. Various seed dips in acetic acid have also been used but chemical or hot water treatments were not shown to be effective. Infection in the seed bed can be prevented byplanting clean seed and prior steam sterilization of the planting mix, flats, benches and equipment which may contact the young seedlings. Some resistance is known and has probably been incorporated into the newer fresh market varieties. Unfortunately the old heirloom varieties do not possess resistance.

Bacterial Canker of Tomato

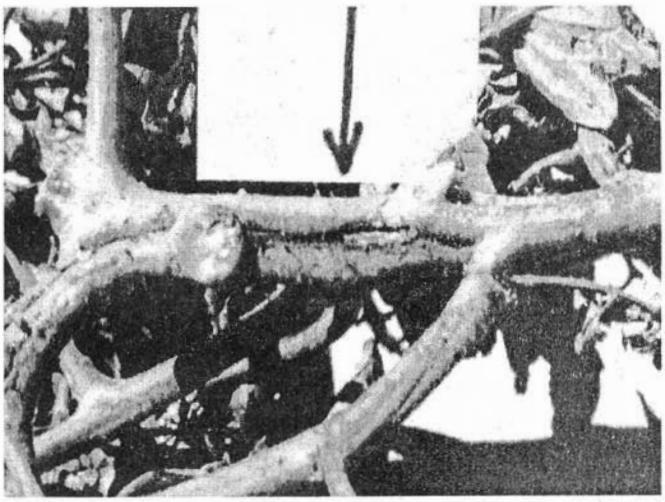

Fig 1. Lysigenous cavity or canker resulting from internal breakdown of cortex and pith.

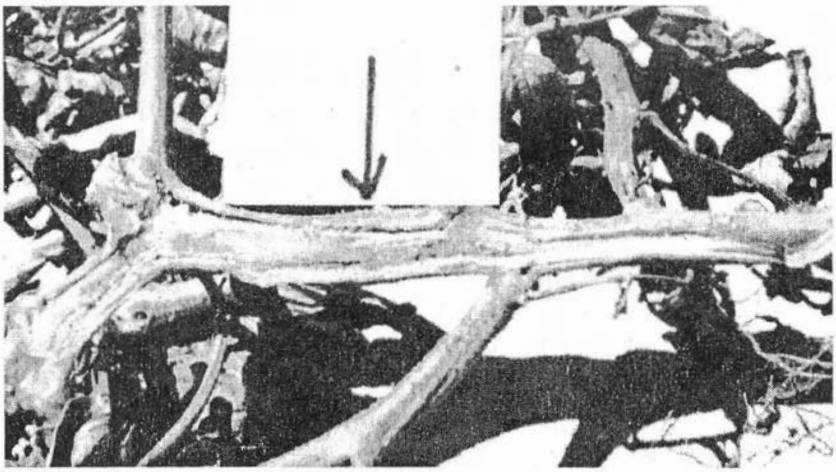

Fig 2. Cut away portion of stem showing the discoloration of the phloem, cortex and pith.

NEMATOLOGY HIGHLIGHTS

NEW STATE RECORDS

Detection of the White Tip of Rice Nematode in California

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The White Tip of Rice Nematode, *Aphelenchoides besseyi*, was recently detected in paddy rice from two California counties. The detection was the result of a project conducted by the Pest Exclusion Branch of CDFA in collaboration with the Nematology Laboratory.

According to the Nematology Laboratory's detection records, *Aphelenchoides besseyi*, has only been detected twice by laboratory nematologists. 1) In 1959, the nematode species was detected in a strawberry sample representing a quarantine shipment which originated in Canby, Oregon and was sent to a nursery in Modesto, Stanislaus County, California. State action against a quarantine pest would result in the rejection and return out-of-state or destruction of the shipment. 2) In 1963 *A. besseyi* was detected in a fungal culture of *Sclerotium oryzae* which was collected from a rice field in Northern California.

The current find of the White Tip of Rice Nematode indicates its limited presence within State, and the successful efforts of the current detection program.

The nematode species is seed borne and is able to survive in the glume axis of rice grains where they aggregate, coil, and enter anabiosis. Reports indicate that the nematodes are able to survive in the rice glume axis for 8 months to 3 years after harvest.

IMPORTANT NEMATODES - GENERAL SYNOPSES

On the following pages are two comprehensive studies of two economically important nematode species. These were compiled by one of our nematologists, Dr. John Chitambar, here at CDFA's Plant Pest Diagnostics Center. These reviews are part of an on-going project by John to develop training aids for field personnel. One such review occurred in the last issue of CPPDR [16(1-2):25-30], and covered the dagger nematode complex, *Xiphinema* spp.

A BRIEF REVIEW OF THE BURROWING NEMATODE, *RADOPHOLUS SIMILIS*[1]

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[1]This article is the second in a series to be published in CPPDR, prepared primarily for the Nematology Training Workshop offered by CDFA's Nematology Laboratory to California state and county participants.

In 1890 Cobb observed males of a new species which he called *Tylenchus similis*, associated with a serious disease of bananas in Fiji. Later, in 1906, he found males and females of another new species which he called *T. biformis* associated with diseased sugar cane roots in Kauai (Hawaii). In 1915, Cobb examined male and female nematodes from diseased banana rhizomes from Jamaica, and became convinced that *T. biformis* was actually *T. similis*. Zimmerman in 1898, found females of a species he called *T. acutocaudatus* from coffee roots in Java. This species was considered by Thorne to be most likely *T. similis*. In 1949, Thorne established the genus *Radopholus* for these species primarily in the genus *Tylenchus*, with *R. similis* as the type species. The genus *Radopholus* comprises about 26 species of important endoparasitic nematodes (Luc, 1987). *Radopholus similis* is amongst the most economically important plant parasitic nematode in tropical regions of the world.

Distribution

Radopholus similis is found worldwide in tropical and sub-tropical regions, and occurs wherever bananas are grown. It has been found in the Fiji Islands, Indonesia, the Philippines, Australia, Central, South and North Americas, several Caribbean Islands, India, Sri Lanka, Pakistan, Thailand, Taiwan and Africa. The nematode species has been introduced into European countries (Belgium, France, the Netherlands, Germany) on infested ornamental plants in greenhouses (Loof, 1991).

In the USA, *R. similis* has been reported from Florida, Hawaii, Arizona, Texas, and Louisiana. The nematode probably occurred only in commercial nursery operations within certain states.

Radopholus similis is an "A" rated, quarantined pest in California. The nematode species is not known to be established in the state, however, it has been discovered and eradicated in commercial nurseries. In 1996, *R. similis* also was discovered in a residential area in Huntington Beach, Southern California, in established banana corms that had been imported from Louisiana. All infested soil has since been excavated and removed, and the area is currently under nematicidal, cultural and sanitary treatment.

Detection

The California Department of Food and Agriculture's Burrowing Nematode Exterior Quarantine Program continues to effectively prevent the introduction of the pest into the State. With the program in effect for several decades, CDFA's Nematology Laboratory, in collaboration with County Agriculture Commissioners Offices, made 16 detections of *R. similis* in 1994 from shipments sent to California, 27 detections in 1995, 17 detections in 1996, and 6 detections in 1997.

Hosts

Radopholus similis has two biological races: a banana race that parasitizes banana and not citrus, and a citrus race that parasitizes both banana and citrus. The citrus race is known from Florida only, while the banana race is widely distributed. Huettle *et al.*, (1984) found differences in enzymes and chromosome numbers between the two races and, consequently, elevated the citrus race to sibling species status as *R. citrophilus*. Kaplan *et. al.*, (1996), however, through random amplified polymorphic DNA analyses, demonstrated genetic similarities between populations of the two sibling species and, thereby, considers both species as the original banana and citrus races within *R. similis*. For all regulatory purposes, the California Department of Food and Agriculture regards *R. similis* as a quarantine pest, comprised of both the banana and citrus races.

There are more than 250 host plants for *R. similis*. The pathogenicity of the nematode is not known for all hosts. Some important hosts include: *Anthurium* spp., *Calathea* spp., *Chamaedorea elegans* (neanthebella palm), *Citrus* spp (some 1275 species and relatives of citrus. Ford, *et al.*, 1960), *Dieffenbachia* spp. (tuffroot), *Hedychium* spp. (ginger lily), *Maranta* spp. (prayer plant), *Monstera* spp., *Musa* spp. (banana), *Nephtytis* spp., *Peperomia* spp., *Persea* spp. (avocado), *Philodendron* spp., *Scindapsus* spp. (pothos), *Spathiphyllum* spp., *Syngonium* spp. (tri-leaf wonder), *Trichosporium* (lipstick plant), *Ananas comosus, Hibiscus esculentus, Indigofera hirsuta, Ipomea batatas, Litchi chinensis, Poncirus trifoliata, Dioscorea alata, Persea americana, Piper nigrum, Zingiber officinale,* and *Coffea* spp. (coffee).

Biology

Life cycle

Radopholus similis is a migratory endoparasite of plant roots. The nematode develops from egg through four larval stages to adults which reproduce sexually and parthenogenically. *Radopholus similis* completes its life cycle in 25 days at 25-28 °C in coconut, 20-25 days at 24-32 °C in banana, and 18-20 days at 24-27° C in citrus. The nematode is able to complete its life cycle within the root cortex, however, vermiform larvae and adults are also present in rhizosphere soil.

Feeding behavior

Females and all larval stages of the nematode are infective and feed on root tissue. Males are morphologically degenerate (without stylet) and do not feed. The nematodes can invade anywhere along roots of banana plants, however, penetration mostly occurs near the root tip. In roots, feeding is restricted to the cortex. The nematodes feed on the cytoplasm of adjacent cells forming cavities which coalesce to appear as tunnels. Cell necrosis sets in, and the cavities become avenues for secondary infection by other micro-oganisms. Eggs are laid within root tissue. *Radopholus similis* does not penetrate hardened epidermis of coconut roots, but will penetrate the region behind the root cap which is covered by very delicate epidermis. The nematode feeds on parenchyma cells of the cortex and stele in citrus roots (Tarjan & O'Bannon, 1984).

Environmental effects on parasitism:

The number of nematodes present in soil and roots varies under the influences of soil temperature, soil texture and soil moisture. Consequently, the highest nematode populations in the field will vary with season. On citrus, *R. similis* is mainly found at soil depths of 60-150 cm (Du Charme, 1967) and can reproduce at 12-30° C, or optimally at 24 °C. In Florida, highest nematode populations in citrus soil are found during late summer-early autumn period during an increase in root growth. Likewise, maximum nematode populations in coconut palm have been found in October-November in India at a depth of 50-100 cm, and at a favorable mean soil temperature of 25°C (Griffith & Koshy, 1990).

Radopholus similis is more pathogenic to citrus in sandy soils than loam or sandy loam soils (O'Bannon & Tomerlin, 1971). On the other hand, *R. similis* multiplies well on coconut in loamy sand followed by riverine alluvium soil. It causes maximum damage in the latter soil. The nematode has been found in soils with 0.5% moisture, and, under greenhouse conditions, in soil moisture of 75-100% field capacity (O'Bannon & Tomerlin, 1971).

Survival

Survival of the Burrowing Nematode in soil can be reduced by the effective destruction and removal of host plant material from the soil. Tarjan (1961) reported that the nematode did not survive in fallow soil, in the absence of host roots and corms. However, it will survive on corms and roots of a host plant for a long time after the above portion of the plant has been removed. Under field conditions, the nematode can survive in moist soil at 27-36° C, and about 1 month in dry soil at 29-39° C. Under greenhouse conditions, the nematode can survive for 15 months in moist soil at 25.5-28.5° C, and up to 3 months in dry soil at 27-31° C. The nematode can survive in coconut roots for up to six months (Griffith & Koshy, 1990).

Symptoms

Above ground symptoms are non-specific and include yellowing, stunting, reduction in number and size of leaves and fruit, delay in flowering, and overall sparse foliage of orchard trees. Infected trees wilt more readily than healthy trees under adverse environmental conditions. Banana plants become uprooted and topple over, especially those burdened with fruit.

Below ground, brown to black lesions are formed at the site of nematode penetration in citrus roots. These lesions coalesce to form a canker. A greater percentage of citrus feeder roots are destroyed below 75 cm than at 25-75 cm. Dark red lesions are found in banana roots. These lesions may coalesce and girdle the root forming black, necrotic lesions which may extend into the corm. Tender roots of coconut seedlings become spongy in texture and small, elongate orange lesion are formed on tender white roots. These lesions enlarge as rot sets in. As the lesioned roots harden, cracks appear in the lesions. Secondary and tertiary roots rot and slough-off quickly on infestation.

Sampling:

Radopholus similis is a migratory endoparasite of plant roots. Collect about one quart roots and rhizosphere soil of a well mixed composite sample. Include roots with symptoms of possible infestation. Sample rootless cuttings when necessary. The nematode has been found in the nodal regions of rootless cuttings. To sample banana plants, collects roots from the base of the stem of the mother plant. This region bears a predominant number of primary roots and high populations of *R. similis*. Great numbers of *R. similis* have been found in the roots of the most actively growing suckers (Thomason & Caswell, 1987). The banana plant comprises a mother plant and a number of lateral daughter suckers. Many roots develop from the mother plants and its suckers until the time of flowering , thereafter, new roots grow out of daughter suckers alone.

Extraction

Radopholus similis is extracted from plant roots by a) chopping and/or macerating roots by hand-shears or blender, b) extracting the nematodes from the chopped material by: jar incubation, Baerman funnel or mist extraction technique. Koshy (1986) extracted *R. similis* from coconut roots by peeling lesioned and discolored roots, slicing longitudinally into eight 3-5 cm pieces and submerging in water in a petri dish at 20-25° C for 4-7 days. Infested roots may also be stained with hot acid fuchsin in lactic acid to detect the presence of the endoparasitic nematodes.

Diagnostic morphology of the genus *Radopholus*

Female: Body less than 1 mm long. Marked sexual dimorphism in the anterior body region: females with low lip region, rounded, continuous or slightly off set from body; (3-4 lip annules in *R. similis*). Female stylet esophagus well developed. Median bulb well developed, basal bulb overlapping anterior intestine mostly dorsally. Vulva at mid body. Ovaries two, opposing. Spermatheca round (with small rod-shaped sperm in *R. similis*). Tail elongate (about 60 mm in *R. similis*, terminal hyaline portion of tail 9-17 mm long in *R. similis*).

Male: Slightly smaller than female. Lip region knob-like and more offset. Stylet and esophagus reduced or absent. Bursa extends over about two-third of tail but does not overlap tail tip.

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A BRIEF REVIEW OF THE RENIFORM NEMATODE, *ROTYLENCHULUS RENIFORMIS*[1]

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[1]This article is the third in a series to be published in *CPPDR*, prepared primarily for the Nematology Training Workshop offered by CDFA's Nematology Laboratory to California state and county participants.

The genus *Rotylenchulus* was established by Linford and Oliviera in 1940 with *R. reniformis* as the type species. The generic name was given by Linford and Oliviera because they thought that the nematode species was similar to the genus *Rotylenchus*. The species name was coined because of the kidney shape of the mature female. There are about ten species in the genus (Fortuner, 1987), but *R. reniformis* is perhaps, the most economically important species of the group.

Distribution

Rotylenchulus reniformis is widely distributed in many tropical and subtropical regions of the world.

In the USA, *R. reniformis* has been reported mainly from the states of Alabama, Arkansas, California, Florida, Georgia, Hawaii, Louisiana, North and South Carolina, Texas, and the Commonwealth of Puerto Rico.

In California, *R.. reniformis* infested *Phoenix roeselenii* and *Cycas* sp. plants were detected in San Diego in 1960, having entered the state in a quarantine shipment. The plants had been established in a residential property before a confirmed diagnosis of the pest had been completed. Subsequently, the plants were removed from the infested site and fumigated with methyl bromide. The planting site was also fumigated with methyl bromide.

Infestations of *R. reniformis* on established *Yucca gloriosa* plants were first detected in 13 residential properties in San Bernardino County in 1967. The infested areas were treated with Nemagon. In 1971, the nematode was detected again in the same locality. Despite a second treatment of Nemagon, new infestations of the nematode appeared in 1973 and 1974. Subsequent herbicide and fumigation trials were conducted, and on December 31, 1978, *R. reniformis* was officially declared eradicated from the infested areas in San Bernardino County. In 1980, the nematode was detected again from areas found free of the nematode in the 1970's. The current status of the San Bernardino infestation is not known.

Detection

California Department of Food and Agriculture's Reniform Nematode Exterior quarantine Program was established in 1997 in order to continue to prevent the introduction of the nematode species through infested plant and associated materials in out-of-state shipments to California. The CDFA Nematology Laboratory has made the following total numbers of

detections of *R. reniformis* in quarantine shipments: 13 detections in 1989, 9 in 1990, 6 in 1991, 0 in 1992, 5 in 1993, 2 in 1994, 4 in 1995, 8 in 1996, 6 in 1997.

Hosts

Rotylenchulus reniformis was first found on cowpea roots in Hawaii. The Reniform Nematode has been found to attack over 140 species of more than 115 plant genera in 46 families. Some of the crops of agricultural importance mentioned by Jatala (1991) include custard apple, papaya, white pigweed, lettuce, sweet potato, mustard greens, cabbage, cucumber, castor bean, barley, rice, sugarcane, corn, beans, onion, cotton, banana, fig, apple, citrus, grapes, tobacco, tomato, potato, carrot, coffee, plum and pear.

Biology

The nematode completes its life cycle in about 24-29 days (17-23 days on cotton). The species is bisexual and reproduces amphimictically. It may also reproduce parthenogenetically. Eggs hatch in about eight days; larvae develop to adults in about nine more days; larvae develop through three molts to pre-adult stage without feeding. All larval stages and males are found in the soil. The male has a poorly developed stylet and esophagus for feeding. The young female is vermiform and has an immature reproductive system. Soon after the final molt the young adult, as the infective stage, seeks to penetrate host roots. On penetration, usually, only the anterior part of the body becomes embedded within root tissue. Feeding occurs on cortical tissue, phloem and pericycle. About one week after penetration, and during feeding, females swell to form the typical kidney shape, and the reproductive system matures. At this time, males are strongly attracted to the females. The cells of the pericycle are malformed, enlarged and remain uninucleate. Females produce 75-120 eggs per day within a gelatinous matrix on the surface of roots.

The nematode is capable of surviving in air-dried soil for extended periods of time (Birchfield & Martin, 1967). Dasgupta and Seshadri (1971) reported the occurrence of two races in India. Reproduction and development of *R. reniformis* is favored by fine textured soils with a relatively high content of silt and/or clay (Robinson *et al.*, 1987).

Symptoms

Above ground symptoms on host plants include dwarfing, shedding of leaves, formation of malformed fruit and seeds, and general symptoms of an impaired root system. Below ground, roots are discolored and necrotic with areas of decay. Plant mortality is possible in heavy infestations. Internally, cells in the region of the feeding site hypertrophy, becoming twice the size of normal cells, somewhat elongated, but regular in shape.

Sampling

Rotylenchulus reniformis are semi-endoparasitic (or sedentary ectoparasitic) nematodes. Larval, males and immature females are found in rhizosphere soil of host plants. Mature females with egg-sacs are found attached to roots. Rhizosphere soil and roots should be collected in

order to detect the presence of the nematode. Bare roots and rootless cuttings should also be sampled even when no accompanying soil is present. The species may be identified from morphological characters of the young female. However, when only roots or cuttings are available, it may be necessary to extract mature females and enhance egg hatch for the development of young stages.

Extraction

Females and egg sacs may be extracted mechanically and examined directly. Nematodes can be extracted from soil using a combination of the gravity sieving technique and Baerman funnel, mist extraction, or sugar centrifugation/flotation technique. To enhance egg hatch from infested root material, chopped roots may be placed in a mist extraction chamber, Baerman funnel, or in a jar with water.

Diagnostic morphology of *Rotylenchulus reniformis*

Immature female: Body vermiform, slender, spiral to C-shaped when relaxed. Lip region elevated, conical, continuous with body, with 4-6 annules. Lip framework heavily sclerotized (thickened). Lateral field with four incisures. Stylet with round knobs sloped posteriorly. Orifice of the dorsal esophageal gland (DGO) about 1 stylet's length behind stylet. Median bulb of esophagus with distinct valve. Basal glands of esophagus overlap intestine laterally and ventrally. Vulva not prominent, at about 70% of body. Ovaries two, immature, opposed. Tail tapers to a narrow rounded terminus with about 20-24 annules, ending in a hyaline portion 4-8 mm long.

Mature female: Body swollen, kidney-shaped, with an irregularly contoured anterior body (neck). Vulva with raised lips. Body beyond anus hemispherical, with a slender terminal portion 5-9 mm long.

Male: Stylet less developed than immature female. Esophagus degenerate with reduced median bulb and valve. Spicules elongate-slender, ventrally curved. Bursa reduced, subterminal.

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BOTANY HIGHLIGHTS

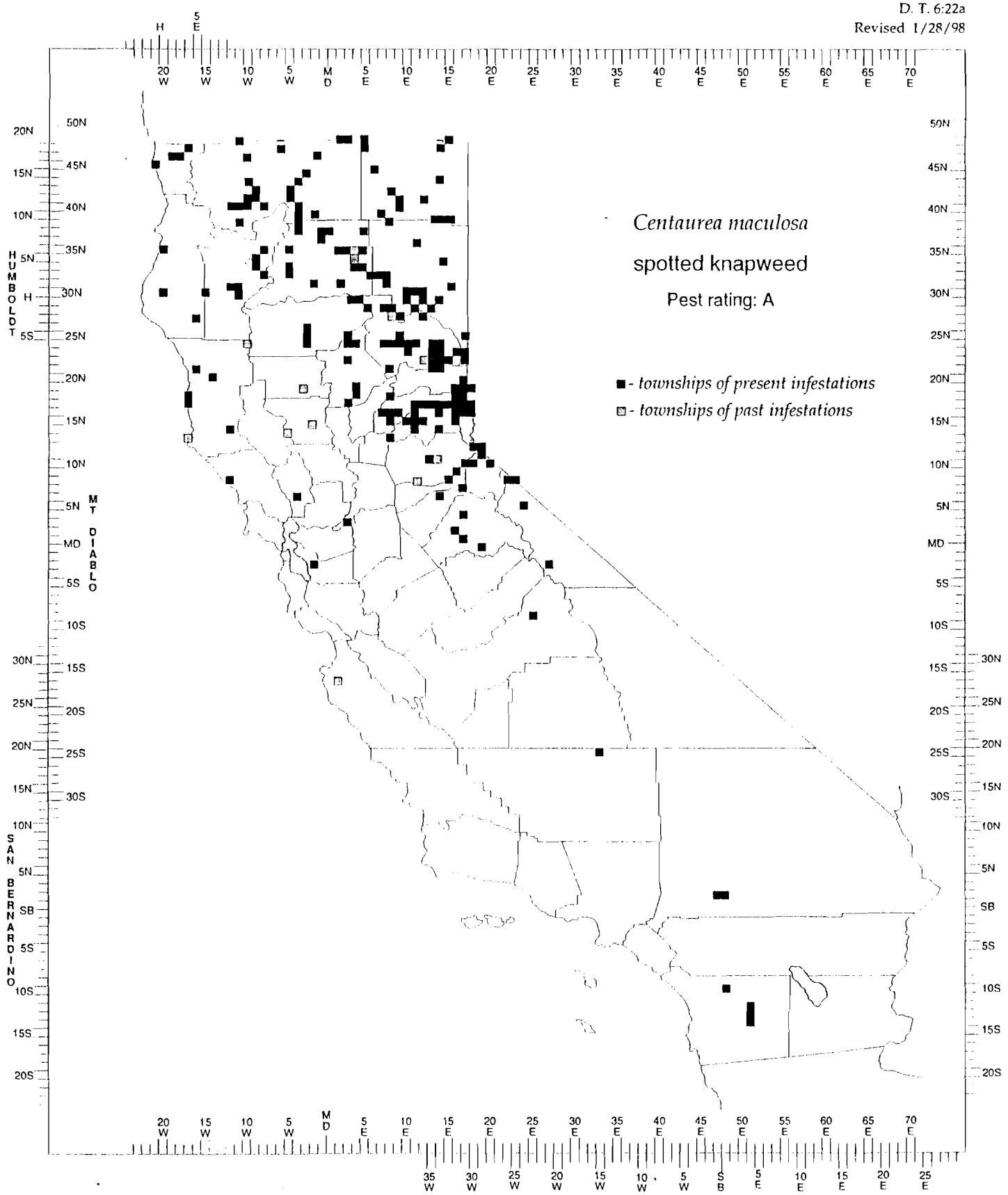
On the following pages are two items dealing with the California distribution of the "A" rated introduced pest plant, spotted knapweed *(Centaurea maculosa)*. First is a distribution map, and second there are multiple pages containing the current verified localities of this weed in the state. These data have been compiled by Dr. Doug Barbe, our former Botanist/ Plant Taxonomist. Doug retired a year ago but continues working with our new Botanist, Dr. Fred Hrusa and CDFA's Integrated Pest Management Branch, to compile data records for all of the "A" and "B" rated weeds in the state. Preliminary distributional maps of these weeds occur in past issues of the CPPDR, but this is the first time that Doug has been able to completely compile all of the available records for a single species, except for the records for yellow star thistle, which have been completed from the original find in California up to 1954.

For a listing of rated California weeds see the article by Doug Barbe in the October-November, 1995 issue of CPPDR 14(5-6):77-110.

STATE OF CALIFORNIA • DEPARTMENT OF FOOD AND AGRICULTURE

DIVISION OF PLANT INDUSTRY • PLANT PEST DIAGNOSTICS BRANCH • BOTANY

DETECTION MANUAL
D. T. 6:22a
Revised 1/28/98



Distribution of "Spotted Knapweed," *Centaurea maculosa,* in California*

Compiled by Dr. Douglas Barbe, Plant Taxonomist
Plant Pest Diagnostics Branch, 1998

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
Alameda County												
1 ALA	1991/10/11	03S	01W	04	M				Smith	C	CDA	**Pleasanton**; I-580 eastbound btwn Eden Cyn Rd & Rowell Ranch Rodeo (Dublin Canyon).
Alpine County												
2 ALP	1988/11/02	10N	20E	08	M			2	Breckenridge	S		**Markleeville**; Hwy 89 edge 1.1 mi S/Sierra Pines Market. 5 plants.
2 ALP	1988/11/02	11N	19E	35	M			5	Breckenridge	S		**Woodfords**; Hwy 88 200ft W/Temporary Inspection Station. 2 plants.
2 ALP	1992/09/03	12N	18E	26	M			1	Breckenridge	S		**Woodfords**; Roadside 1 mi E on Hwy 88. 1 plant.
2 ALP	1992/09/08	10N	17E	27	M			1	Breckenridge	S		**Kirkwood**; Ski area parking lot. 1 plant.
2 ALP	1992/09/08	10N	20E	05	M			1	Breckenridge	S		**Woodfords**; Roadside Hwy 89. 1 plant.
2 ALP	1992/10/08	10N	20E	26	M	0.01	0.01		Stewart	C		**Carson Pass**; S/Eastside Resort 0.6 mi.
2 ALP	1992/10/08	12N	18E	22	M			1	Stewart	C		**Carson Pass**; Hwy 88. 1 plant.
Amador County												
3 AMA	1980/11/07	08N	11E	34	M			2	Farnham	C		**Fiddletown**; Two plants. Eradicated 1983.
3 AMA	1987/08/11	09N	16E	21	M	0.01	0.25		Farnham	C		**Pioneer**; Hwy 88 3 mi E/Peddler Hill Maintenance Station.
3 AMA	1988/07/28	08N	15E	15	M			1	Farnham	C		**Hams Station**; Hwy 88 4.5 mi E. 1 plant.
3 AMA	1988/08/23	10N	17E	29	M			1	Farnham	C		**Kit Carson**; S/side Hwy 88 1.2 mi E/Silver Lake. 1 plant.
3 AMA	1989/09/08	09N	16E	14	M		0.01	1	Farnham	C		**Bear River**; Hwy 88 0.75 mi E/Shot Rock Vista. 1 plant.
3 AMA	1992/08/05	10N	18E	22	M	0.01	0.01		Farnham	C		**Caples Lake**; Carson Pass, Red Lake Vista Point.
3 AMA	1993/08/26	09N	16E	31	M	0.02	0.02		Farnham	C		**Pioneer**; Hwy 88 at Foster Meadow Rd.
Butte County												
4 BUT	1970/07/22	24N	03E	21	M			1	Gilbert	C	CAS, CDA	**Forest Ranch**; Hwy 32 NE/Chico W/CDF Fire Station. 1 plant.
4 BUT	1971/08/15	19N	04E	01	M			5	Roberson	S		**Oroville**; Oroville Dam Observation area. 5 plants.
4 BUT	1971/08/18	19N	04E	01	M			5	Fuller 19925	S	CDA	**Oroville**; Oroville Dam Observation Area. 5 plants.
4 BUT	1973/06/25	24N	04E	28	M	1.00	100.00		Heinrichs	C	CDA	**Stirling City**; Stirling City.

*Current as of 2/11/98

County		Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector		Af	Herbarium	Notes
4	BUT	1973/09/11	22N	03E	01	M			6	Heinrichs	C			**Paradise;** Opp 7050 Clark Rd. 6 plants.
4	BUT	1975/06/19	24N	04E	28	M				Gianelli	C			**Stirling City**; Stirling City.
4	BUT	1993/06/23	25N	03E	22	M	0.01	0.01		Keck	S			**Forest Ranch;** E/side Hwy 32 0.3 mi S/MP 34.
4	BUT	1993/08/11	25N	03E	33	M			3	Keck	S			**Forest Ranch**; E/side Hwy 32 100yds N/MP 32. 3 plants.
4	BUT	1995/07/26	24N	04E	33	M	0.01	0.01		Keck	S			**Stirling City**; N/side Skyway 0.9 mi W/Post Office.
Calaveras County														
5	CAL	1989/08/31	07N	17E	34	M				Norfolk	C			**Big Meadow**; 1 mi E on Hwy 4.
5	CAL	1989/09/12	07N	17E	24	M				Norfolk	C			**Lombard**; Hwy 4 MP 65.00.
5	CAL	1989/09/12	07N	17E	32	M			40	Norfolk	C			**Big Meadow**; W on Hwy 4 opp Cabbage Patch Maintenance Station. 40 plants.
5	CAL	1993/08/17	07N	17E	34	M			1	Norfolk	C			**Big Meadow**; 1 mi E on Hwy 4. 1 plant.
5	CAL	1997/07/15	06N	14E	21	M				Kerstan	C			**Wilseyville**; Mitchell Mill Rd.
Colusa County														
6	COL	1988/04/22	15N	02W	S30	M			3	Breckenridge	S			**Williams**; I-5 northbound 0.7 mi S/MP 15.00. 3 plants. Eradicated 1994.
6	COL	1995/07/11	14N	05W	35	M				Joley	S			**Wilbur Springs**; Hwy 20 within 50ft/MP 2.63.
Del Norte County														
8	DNT	1990/08/23	17N	03E	S16	H			10	Keck	S			**Patrick Creek**; Hwy 199 0.3 mi W on N/side. 10 plants.
8	DNT	1990/08/23	18N	04E	S32	H			20	Keck	S			**Patrick Creek**; E/side Hwy 199 N&S/MP 28.63. 20 plants.
8	DNT	1990/08/23	18N	04E	29	H			6	Keck	S			**Horse Flat**; S/side Hwy 199 0.1 mi E/Knopti Creek Rd. 6 plants. Redding District Report 1990.
8	DNT	1990/10/—	17N	02E	23	H			1	Anderson	C			**Gasquet**; S/side Hwy 199 ca 1 mi E/Pioneer Rd E/ Darlingtonia. 1 plant. Redding District Report 1990.
8	DNT	1990/10/—	17N	02E	24	H	<0.01	0.01		Anderson	C			**Gasquet**; N/side Hwy 199 opp Grassy Flat CG. Redding District Report 1990.
8	DNT	1990/10/—	16N	01W	28	H			1	Anderson	C			**Crescent City**; W/side Hwy 101 at ACI CG. 1 plant. Redding District Report 1990.
El Dorado County														
9	ELD	1977/11/05	11N	14E	30	M			2	Joley	S	CDA		**Riverton** W on Hwy 50 northside at MP 38.48. 2 plants. Eradicated 1982.
9	ELD	1979/08/06	11N	14E	30	M			5	Stewart	C			**White Hall**; Hwy 50 N/side btwn MP 38.48 & MP 38.68. 5 plants. Eradicated 1982.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
9 ELD	1992/09/03	11N	13E	34	M			10	Breckenridge	S		**Pacific**; Roadside Hwy 50 at Union Bend. <10 plants.
Fresno County												
10 FRE	1986/08/11	09S	25E	17	M				Dunnicliff	C	CDA	**Shaver Lake**; Hwy 168 1.4 mi. E/Big Creek turnoff.
Glenn County												
11 GLE	1977/07/12	19N	03W	21	M			1	Romano	C		**Willows**; I-5 roadside. 1 plant. Eradicated 1982.
Humboldt County												
12 HUM	1988/09/22	03S	05E	24	H	1.00	75.00		Pittman	C		**Alderpoint**; Zenia Rd. Redding District Report 1988.
12 HUM	1989/10/19	06N	01E	17	H	<0.01	<0.01		Pittman	C		**Arcata**; Hwy 101 MP 88.50.
12 HUM	1990/08/22	01N	01E	22	H	<0.01	25.00		Pittman	C		**Scotia**; Hwy 101 near MP 59.
12 HUM	1993/08/25	01N	06E	18	H				Keck	S	CDA	**Mad River**; N/side Hwy 36 0.5 and 0.3 miles W/co line.
Kern County												
15 KRN	1996/06/18	25S	33E	15	M	1.00			Peet	C		**Kernville**; vacant lot, northeast corner Burlando and Whitney roads.
Lassen County												
18 LAS	1962/08/15	25N	17E	20	M				Wheeler	C	CDA	**Doyle**; 1.7 mi S on W/side Hwy 395.
18 LAS	1962/08/28	25N	17E	20	M				Fuller 9472	S	CAS, RSA, CDA	**Doyle**; 1.7 mi S on W/side Hwy 395.
18 LAS	1975/09/02	29N	14E	15	M			1	Somerville	C		**Litchfield**; Hwy 395. 1 plant.
18 LAS	1976/07/06	23N	17E	21	M			7	Keck	S		**Constantia**; 3 mi N/Hwy 70 btwn WPRR and Long Valley Creek. 7 plants.
18 LAS	1979/08/22	31N	08E	10	M			1	Thorne	C		**Susanville**; Hwy 44 50ft E/MP 17.00. 1 plant.
18 LAS	1980/08/21	39N	13E	32	M			1	Clark	S		**Madeline**; W/side Hwy 395 0.5 mi N/MP 132.50, near Modoc Co line. 1 plant.
18 LAS	1981/08/05	29N	10E	30	M			2	Morris	S		**Westwood**; Hwy 36 btwn Ranch & The Meadows Cafe. 2 plants.
18 LAS	1982/07/08	36N	11E	31	M			1	Keck	S		**Termo**; W/side Hwy 139 0.25 mi S/Grasshopper-Termo Rd. 1 plant.
18 LAS	1982/08/23	31N	08E	10	M				Haig	S		**Susanville**; Hwy 44 2.4 mi SE/Bogard Ranger Station.
18 LAS	1982/08/24	29N	10E	30	M			2	Haig	S		**Westwood**; Hwy 89 2.5 mi W/Fredonyer Pass Summit. 2 plants.
18 LAS	1988/07/27	28N	13E	23	M			2	Keck	S		**Janesville**; Hwy 395 3.5 mi E/Church St. 2 plants.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
18 LAS	1988/07/27	29N	12E	10	M			12	Keck	S		**Susanville**; Hwy 36 1.6 and 1.8 miles E/SPRR crossing. 12 plants.
18 LAS	1988/08/15	32N	08E	30	M			10	Hale	C		**Bogard RS**; SR 44. 10 plants. Redding District Report 1988.
18 LAS	1990/09/26	36N	11E	31	M			20	Keck	S		**Termo**; W/side Hwy 139 btwn Termo turnoff south to cattle guard. 20 plants.
18 LAS	1991/09/04	31N	15E	35	M				Keck	S		**Ravendale**; S on Hwy 395 0.6 mi N/Karlo Rd E/ side.
18 LAS	1991/09/04	34N	14E	06	M				Keck	S		**Ravendale**; 4 mi N on W/side Hwy 395.
18 LAS	1991/09/11	22N	17E	14	M			2	Surber	C		**Chilcoot Pass**; 1 mi S/Hallelujah Junction. 2 plants.
18 LAS	1993/07/15	30N	12E	32	M			1	Keck	S		**Susanville**; N/side Paul Bunyan St W/Chestnut. 1 plant. Redding District Report 1993.
18 LAS	1994/-/07	29N	12E	03	M	8.00	25.00		Smith	C		**Susanville**; Field along Susan River behind Walmart. Redding District Report 1994.
18 LAS	1994/07/28	30N	10E	26	M	0.10	0.20		Keck	S		**Susanville**; S/side Hwy 44 100ft E/MP 34.50.
18 LAS	1995/08/14	38N	08E	02	M	0.01	0.01		Kreps	S		**Adin**; Hwy 299E opp MP22.50 3.5 mi from jct 299E/139.
18 LAS	1995/08/25	31N	08E	04	M	0.50	3.00		Lytle	C		**Bogard RS**; Jct Hwy 44/Crater Lake/McKenzie Cow Camp roads. Plants along each road. Redding District Report 1995.
18 LAS	1996/07/10	32N	06E	11	M			1	Kreps	S		**Old Station**; Hwy 44 W/Butte Lake turnoff. 1 plant.
18 LAS	1996/08/15	32N	07E	09	M			1	Kreps	S		**Old Station**; N/side Hwy 44, W/end Poison Lake. 1 plant, removed. Redding District Report 1996.
18 LAS	1997/06/25	30N	11E	34	M			1	Keck	S		**Susanville**; S/side Hwy 36 0.1 mi E/River Bench Rd. 1 plant.
18 LAS	1997/10/08	39N	15E	33	M	0.01	0.01		Keck	S		**Likely**; N/side Modoc Co Rd 258 5.4 mi E/Pit River Bridge 0.3 mi W/old site.
Mendocino County												
23 MEN	1975/09/28	13N	17W		M				Tilforth 1146	O	RSA, UC	**Manchester**; Hwy 1 btwn Manchester and Point Arena. Occasional.
23 MEN	1976/08/19	17N	17W	18	M			1	Schmidt	S		**Fort Bragg**; 7 mi S on Hwy 1, 0.5 mi N/Russian Gulch State Park. 1 plant. Eradicated 1982.
23 MEN	1986/08/27	24N	10W	11	M				Black	C		**Covelo**; NE on USFS Rd 23N01 near Tehama Co line. Eradicated 1990.
23 MEN	1990/09/11	17N	17W	19	M			3	Breckenridge	S	CDA	**Mendocino**; Hwy 1 MP 54.60. 3 plants, removed.
23 MEN	1991/08/19	14N	12W	04	M			3	Xerogeanes	C		**Ukiah**; Hwy 101 median MP 20.82. 3 plants.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector		Af	Herbarium	Notes
23 MEN	1991/08/19	14N	12W	22	M			1	Xerogeanes	C			**Ukiah**; W/side Hwy 101 MP 18.85. 1 plant.
23 MEN	1993/08/10	20N	14W	33	M			4	Xerogeanes	C	CDA		**Longvale**; E/side Hwy 101 100ft N/MP 58.54. 4 plants.
23 MEN	1993/08/10	21N	16W	21	M				Xerogeanes	C			**Laytonville**; E/side Hwy 101.
23 MEN	1993/09/29	20N	14W	20	M			3	Breckenridge	S	CDA		**Laytonville**; Hwy 101 MP 60.39. 3 plants.
23 MEN	1993/11/17	18N	17W	17	M			1	Xerogeanes	C	CDA		**Fort Bragg**; 0.3mi E/Hanson Rd S/side gravel rd, Pygmy Forest area. 1 plant.
23 MEN	1994/07/13	20N	14W	25	M			1	Xerogeanes	C			**Willits**; W/side Hwy 101 on Oil Well Hill. 1 plant.
Modoc County													
25 MOD	1968/08/08	41N	09E	10	M	0.01	0.05		Talbert	S			**Canby**; Hwy 299 ca 1 mi NE/Canby E/MP 18.08.
25 MOD	1974/08/27	44N	14E	05	M	0.20	3.00		Fuller	S			**Davis Creek**; 3.6 mi S on Hwy 395, S/MP 39.00.
25 MOD	1980/08/07	45N	06E	28	M			1	Greenbank	C			**Tionesta**; W/side Hwy 139 25yds S/MP 31.00. 1 plant.
25 MOD	1981/07/24	45N	06E	28	M			1	Greenbank	C			**Tionesta**; One plant.
25 MOD	1981/08/05	45N	06E	28	M				Kelley	C			**Tionesta**; Hwy 139 near power line, Dry Lake Ranch.
25 MOD	1983/08/11	47N	14E	11	M				Kreps	S			**Willow Ranch**; E/side Hwy 395 0.1 mi S/MP 59.00.
25 MOD	1984/06/19	48N	15E	34	M	<0.01	<0.01		Keck	S			**Willow Ranch**; S/side Co Rd 45 3.6 mi E/Hwy 395.
25 MOD	1987/08/05	44N	06E	03	M				Keck	S			**Perez**; Hwy 139. Redding District Report 1987.
25 MOD	1987/09/19	45N	06E	28	M			1	Kelley	C			**Newell**; Hwy 139. 1 plant.
25 MOD	1989/07/21	39N	07E	02	M	<0.01	0.01		Keck	S			**Lookout**; E/side Co Rd 91 2.7 mi N/Pit River Bridge.
25 MOD	1990/08/30	47N	14E	21	M	2.00	40.00		Monroe	C			**Willow Ranch**; Old Willow Ranch mill site. Redding District Report 1990.
25 MOD	1990/08/30	47N	14E	22	M	2.00	40.00		Monroe	C			**Willow Ranch**; Old Willow Ranch mill site. Redding District Report 1990.
25 MOD	1992/06/16	42N	08E	04	M	0.01	0.01		Deal	C			**Canby**; Hwy 139.
25 MOD	1992/07/10	45N	06E	33	M	0.01	0.03		Deal	C			**Tulelake**; Hwy 139.
25 MOD	1995/02/15	47N	05E	25	M			1	Deal	C			**Tulelake**; Co Rd 141 in gravel pit. 1 plant.
25 MOD	1995/07/—	40N	09E	14	M	0.10	0.50		Seago	C			**Adin**; USFS Rd 41N11 1.0 mi W/Hwy 299. Redding District Report 1995.
25 MOD	1995/07/07	47N	05E	07	M			1	Deal	C			**Newell**; W/side Hwy 139 150ft S/Boyd Farms entrance. 1 plant. Redding District Report 1995.
25 MOD	1995/08/14	40N	09E	14	M			1	Kreps	S			**Adin**; 2.1 mi S/Adin Pass summit. 1 plant.
25 MOD	1995/08/23	39N	14E	24	M	1.00	5.00		Smith	C	CDA		**Likely**; Jess Valley, USFS Rd 39N01 E/West Valley Reservoir.
25 MOD	1996/06/30	41N	12E	24	M			1	Keck	S			**Alturas**; S on W/side Hwy 395. 1 plant, removed. Redding District Report 1996.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
Mono County												
26 MNO	1986/08/06	05N	24E	25	M			1	Hitchcock	S		**Bridgeport**; 2.5 mi W on Hwy 395. 1 plant.
26 MNO	1988/07/21	08N	22E	12	M			1	Hitchcock	S		**Coleville**; W/side Hwy 395, Meadowcliff Motel. 1 plant.
26 MNO	1988/07/21	08N	23E	18	M	0.05	3.00		Hitchcock	S		**Walker**; S/Larson Ln on W/side Hwy 395.
26 MNO	1991/07/12	08N	23E	19	M			50	Hitchcock	S		**Walker**; W/side Hwy 395 0.2 mi S/Mill Creek Rd. 50 plants.
26 MNO	1991/09/05	03S	27E	34	M			7	Milovich	C	CDA	**Mammoth Lakes**; Seven plants.
Monterey County												
27 MNT	1978/10/02	16S	02E	01	M			3	Oliver	C	CAS	**Spreckels**; Three plants just N/129 San Benancio Rd. Eradicated 1982.
Napa County												
28 NAP	1990/10/29	06N	04W	33	M			1	Kemmerer	C		**Napa**; SW corner Redwood at Hwy 29. 1 plant.
Nevada County												
29 NEV	1963/10/13	17N	11E	28	M				Mott 4563	O	CAS	**Emigrant Gap**; Hwy 20 16 mi E/Nevada City near Omega Mine H.M.
29 NEV	1964/10/05	18N	17E	36	M				True 1702	O	CAS	**Hirschdale**; 2.5 mi E on Truckee River near Gray Creek.
29 NEV	1968/07/09	16N	08E	33	M				Taylor	C		**Grass Valley**; McCourtney Rd near Nevada County fairgrounds.
29 NEV	1971/08/13	17N	14E	20	M	0.10	2.00		Benincasa	C		**Kingvale**; I-80 eastbound.
29 NEV	1971/10/06	17N	16E	02	M			1	Fuller	S		**Hobart Mills**; E/side Hwy 89 70 ft N/MP 01.33. 1 plant.
29 NEV	1971/10/21	17N	13E	19	M	0.10	0.20		Benincasa	C		**Cisco Grove**; I-80 eastbound.
29 NEV	1976/07/13	18N	17E	31	M	0.16			Gunderson	C		**Truckee**; I-80 westbound at MP 19.34
29 NEV	1976/07/14	17N	15E	10	M			30	Gunderson	C		**Donner Lake**; I-80 westbound. 30 plants.
29 NEV	1976/08/12	18N	17E	31	M	0.01	2.00		Ferlatte	S		**Truckee**; I-80 westbound at MP 19.34.
29 NEV	1977/08/02	17N	12E	27	M			6	Wilcox	C		**Yuba Gap**; I-80 eastbound 120 ft E/Yuba Gap Exit. 6 plants.
29 NEV	1977/08/05	17N	15E	14	M	0.02			Gunderson	C		**Donner Lake**; I-80 westbound btwn rest area and Donner Lake Exit.
29 NEV	1977/08/29	17N	16E	09	M			1	Gunderson	C		**Truckee**; SE/Northwoods & Northwoods Blvd. 1 plant.
29 NEV	1978/08/10	17N	11E	28	M			1	Gunderson	C		**Emigrant Gap**; Hwy 20 0.25 mi NE/Alpha Omega Rest Area. 1 plant.
29 NEV	1980/05/22	15N	08E	06	M			1	Taylor	C		**Penn Valley**; One plant.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector		Af	Herbarium	Notes
29 NEV	1980/07/18	16N	07E	31	M			1	Gunderson	C			**Penn Valley**; Hwy 20 200ft W/MP 3.47. 1 plant.
29 NEV	1981/07/14	16N	09E	09	M			10	Gunderson	C			**Nevada City**; 100ft E/Murchie Mine Rd on Incline Shaft Rd. 10 plants.
29 NEV	1981/08/03	16N	09E	20	H			1	Webb	C			**Nevada City**; Opp 12420 Valley View Rd. 1 plant.
29 NEV	1991/08/13	18N	17E	34	M	2.00	2.00		Gunderson	C			**Hirschdale**; 10867 Floristan Rd.
29 NEV	1995/06/26	18N	17E	16	M	0.01	1.00		Kerr	S	CDA		**Truckee**; Boca Rest Campground.
29 NEV	1995/08/23	17N	16E	10	M	0.25	5.00		Gunderson	C			**Truckee**; Truckee High School, Donner Pass Rd.
29 NEV	1995/09/05	17N	18E	15	M	0.02	0.25		Kerr	S			**Truckee**; Front lawn 10476 Palasades Rd.
29 NEV	1995/09/13	17N	16E	08	M	0.01	0.10		Kerr	S			**Truckee**; 11361 Northwoods Blvd.
Placer County													
31 PLA	1963/08/28	17N	13E	27	M			1	Fuller 11177	S	CAS, CDA		**Cisco Grove**; N/side I-80 eastbound 0.5 mi E/ Hampshire Rocks. 1 plant.
31 PLA	1964/09/01	17N	13E	27	M				Fuller 12569	S	CDA		**Cisco Grove**; N/side I-80 eastbound. 120 sq ft
31 PLA	1965/08/10	15N	10E	18	M				Fuller	S			**Magra**; N/side I-80 westbound, Magra Rd over-pass.
31 PLA	1965/08/10	16N	11E	02	M				Fuller 13944	S	CDA		**Blue Canyon**; I-80 westbound 0.1 mi E/Blue Canyon Rd S/side. 100 sq ft.
31 PLA	1965/08/10	16N	11E	02	M				Fuller 13944	S	CAS, CDA		**Blue Canyon**; I-80 westbound 0.1 mi W/Blue Canyon Rd. 100 sq ft.
31 PLA	1965/08/10	17N	12E	29	M				Fuller 13942	S	CDA, RSA		**Emigrant Gap**; I-80 westbound 1.4 mi E on S/ side. 100 sq ft.
31 PLA	1975/08/05	16N	11E	2	M	<0.01	<0.01	3	Reeves	C			**Emigrant Gap**; I-80 westbound near Tahoe NF boundary. 3 plants.
31 PLA	1975/08/05	16N	11E	21	M			1	Reeves	C			**Blue Canyon**; I-80 westbound at Blue Canyon Exit. 1 plant.
31 PLA	1979/07/19	17N	13E	29	M				Stark	C			**Cisco Grove**; I-80 westbound 0.5 mi W on S/side.
31 PLA	1980/05/05	16N	18E	19	M	0.01	1.00		Stark	C			**Kings Beach**; 8070 N Lake Blvd.
31 PLA	1982/09/14	16N	11E	15	M			6	Stark	C			**Blue Canyon**; N/side I-80 eastbound. 6 plants.
31 PLA	1982/09/21	15N	16E	36	M			1	Stark	C			**Tahoe Pines**; Blackwood Canyon Rd. 1 plant.
31 PLA	1986/10/20	16N	16E	31	M			10	Stark	C			**Squaw Valley**; Olympic Village, Nordic Center Parking. 10 plants.
31 PLA	1990/07/11	13N	08E	27	M			2	Stark	C			**Auburn**; Bell Rd. 2 plants.
31 PLA	1990/09/12	15N	12E	07	M			15	Stark	C			**Foresthill**; Foresthill Rd, Tahoe NF. 15 plants.
31 PLA	1990/09/12	15N	12E	08	M			9	Stark	C			**Foresthill**; Foresthill Rd, Tahoe NF. 9 plants.
31 PLA	1990/09/12	15N	12E	13	M			2	Stark	C			**Foresthill**; Foresthill Rd, Tahoe NF. 2 plants.
31 PLA	1991/06/26	17N	13E	29	M	0.25	5.00		Breckenridge	S			**Cisco Grove**; I-80 eastbound/center. Re-survey of 1979 site.
31 PLA	1992/08/14	14N	14E	09	M			1	Stark	C			**Hell Hole**; USFS Rd 24, Eldorado NF. 1 plant.
31 PLA	1992/09/02	15N	12E	32	M			1	Stark	C			**Foresthill**; Deadwood Ridge near clear cut area.
31 PLA	1994/01/20	16N	11E	02	M			30	Kerr	S			**Nyack**; I-80 eastbound Nyack Onramp. <30 plants.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
31 PLA	1994/01/20	16N	14E	20	M			5	Kerr	S		**Kingvale**; I-80 eastbound Kingvale Exit. 5 plants.
31 PLA	1994/08/25	16N	17E	03	M			1	Stark	C		**Kings Beach**; Hwy 262 near Brockway Summit. 1 plant.
31 PLA	1995/09/05	16N	16E	28	M				Eng	S		**Squaw Valley**; Dooryards, 131 & 139 Tiger Tail Dr.
31 PLA	1996/08/29	17N	17E	32	M	0.02	0.25		Connelly	C		**Truckee**; Silver Strike & Northstar Dr.
31 PLA	1997/07/23	14N	11E	01	M				Van Zuuk	F		**Michigzn Bluff**; roadside; road to ElkhornMine; Codfish area, Tahoe NF.
31 PLA	1997/09/25	16N	17E	12	M				Anderson	S		**Kings Beach**; 200 Friars Dell Ct, Kingswood subdivision. Truckee Ag Insp Sta intercept.
Plumas County												
32 PLU	1959/09/24	25N	09E	03	M				Howell 34923	O	CAS	**Indian Falls**; Indian Creek Cyn.
32 PLU	1966/07/18	24N	09E	10	M		0.10		Budaj	C	CAS	**Quincy**; E/Courthouse Annex near County Hospital.
32 PLU	1966/09/30	21N	13E	04	M				Budaj	C	CAS	**Clio**; Hwy 89 at Sulphur Springs Rd.
32 PLU	1971/08/03	23N	14E	27	M			1	Surber	C		**Beckwourth**; 0.5 mi W/Co Rd A23 on S/side Hwy 70 1 mi E/Portola Rest Stop. 1 plant, removed. Co rec #79 3/30/89.
32 PLU	1972/-/-	23N	10E	04	M			1	Surber	C		**Quincy**; E/side La Porte Rd 7 mi S/Hwy 70. 1 plant, removed. Co rec #76 3/30/89.
32 PLU	1972/08/18	23N	10E	10	M			1	Swanson	C		**Quincy**; La Porte Rd. 1 plant.
32 PLU	1972/09/13	24N	09E	23	M				Gianelli	C		**Quincy**; County Health Dept Bldg. Few plants.
32 PLU	1973/07/18	23N	10E	09	M			6	Swanson	C		**Quincy**; La Porte Rd 6.4 mi S/Hwy 70. 6 plants.
32 PLU	1973/07/20	23N	14E	28	M				Surber	C		**Beckwourth**; Hwy 70 Rest Area E/Portola. Co rec #33 3/30/89.
32 PLU	1973/09/18	23N	13E	26	M				Surber	C		**Portola**; E/side Lake Davis Rd, Carmichael Ranch. Co rec #27 3/30/89.
32 PLU	1975/10/05	24N	07E	36	M				Joley	S		**Bucks Lake**; 10 mi SW/Quincy on Bucks Lake Rd.
32 PLU	1976/-/-	24N	07E	36	M				Surber	C		**Bucks Lake**; 0.25 mi N/Whitehorse Camp;
32 PLU	1977/-/-	27N	09E	30	M			100	Surber	C		**Greenville**; 5 mi. N on Union Pacific ROW. 100 plants. Co rec #74 3/30/89.
32 PLU	1977/08/24	22N	14E	14	M			45	Surber	C		**Beckwourth**; W/side Co Rd A23, Money Ranch, Sierra Valley. 45 plants. Co rec #29 3/30/89.
32 PLU	1977/11/08	25N	09E	27	M	0.10	1.50	100	Swanson	C		**Keddie**; RR yard.100 plants. Co rec #30 3/30/89.
32 PLU	1978/-/-	22N	13E	08	M			1	Surber	C		**Blairsden**; N/side Hwy 70 2.5 mi E/Hwy 89. 1 plant, removed. Co rec #80 3/30/89.
32 PLU	1979/-/-	22N	15E	17	M			2	Surber	C		**Beckwourth**; Francis Carmichael Ranch, Co Rd A24. 2 plants, removed. Co rec #54 3/30/89.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
32 PLU	1979/08/01	28N	07E	19	M			15	Horn	C		**Chester**; Hwy 89. 15 plants.
32 PLU	1979/08/24	24N	11E	31	M			2	Horn	C		**Spring Garden**; 1.0 mi W on W/side Hwy 70. 2 plants, removed. Co rec #52 3/30/89.
32 PLU	1980/-/-	22N	12E	09	M			1	Surber	C		**Mohawk**; Plumas-Eureka Rd 0.5 mi W/Mohawk Rd. 1 plant, removed. Co rec #55 3/30/89.
32 PLU	1980/-/-	22N	12E	10	M			2	Surber	C		**Blairsden**; Whit Barn, Hwy 89/70 intersection. 2 plants, removed. Co rec #77 3/30/89.
32 PLU	1981/-/-	28N	08E	17	M			4	Surber	C		**Chester**; Co Rd A13 1 mi E/Peninsula Dr north shore Lake Almanor. 4 plants, removed. Co rec #53 3/30/89.
32 PLU	1981/08/05	28N	07E	36	M			2	Morris	S		**Lake Almanor**; Co Rd A13. 2 plants.
32 PLU	1982/-/-	23N	16E	34	M			40	Surber	C		**Vinton**; E/side Hwy 49 0.5 mi S/Hwy 70. 40 plants.
32 PLU	1982/08/13	24N	09E	22	M			2	Surber	C		**Quincy**; Church & High St. 2 plants, removed. Co rec #96 3/30/89.
32 PLU	1982/09/11	22N	15E	17	M				Surber	C		**Beckwourth**; Co Rd A24.
32 PLU	1983/-/-	28N	07E	19	M			2	Surber	C		**Chester**; W/side Hwy 89 0.5 mi S/Hwy 36. 2 plants, removed.
32 PLU	1984/07/-	28N	08E	21	M				Horn	C		**Big Springs**; Lake Almanor.
32 PLU	1985/-/-	22N	15E	17	M			3	Surber	C		**Beckwourth**; Francis Carmichael Ranch, Co Rd A24. 3 plants, removed. Co rec #37 3/30/89.
32 PLU	1985/07/-	28N	08E	17	M				Horn	C		**Lake Almanor**; Peninsula Village.
32 PLU	1986/-/-	24N	08E	23	M			3	Surber	C		**Meadow Valley**; Carol Hill Road. 3 plants, removed. Co rec #31 3/30/89.
32 PLU	1986/-/-	27N	08E	28	M			2	Surber	C		**Canyon Dam**; Hwy 147 N/Lake Almanor dam. 2 plants, removed. Co rec #32 3/30/89.
32 PLU	1987/-/-	25N	09E	35	M			2	Surber	C		**Quincy**; Hwy 70, 2 mi N/Oakland Camp Road. 2 plants. Co rec #35 3/30/89.
32 PLU	1987/-/-	28N	07E	18	M			3	Surber	C		**Chester**; SW on Hwy 36, Feather River overflow. 3 plants. Co rec #34 3/30/89.
32 PLU	1987/-/-	28N	08E	17	M			10	Surber	C		**Chester**; Co Rd A13 and Peninsula Dr, north shore Lake Almanor. 10 plants.
32 PLU	1988/-/-	22N	12E	10	M			1	Surber	C		**Blairsden**; E/side
32 PLU	1988/-/-	24N	08E	14	M			1	Surber	C		**Meadow Valley**; Jack Brown property, N/side Meadow Valley Rd. 1 plant. Co rec #90 3/30/89.
32 PLU	1988/-/-	24N	09E	16	M			1	Surber	C		**Quincy**; Hale Charlton property, Meadow Valley Rd. 1 plant. Co rec #89 3/30/89.
32 PLU	1988/-/-	24N	10E	23	M			2	Surber	C		**East Quincy**; Hwy 70 0.5 mi E/Massack Rest Area. 2 plants. Co rec #105 3/30/89.

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32 PLU	1988/10/13	22N	14E	23	M			1	Keck	S		**Beckwourth**; W/side Rd A23 5.6 mi S/Hwy 70. 1 plant. Redding District Report 1988.
32 PLU	1989/08/01	25N	09E	15	M			2	Horn	C		**Keddie**; Hwy 70. 2 plants.
32 PLU	1989/08/23	21N	08E	25	M			1	Horn	C		**La Porte**; 3.5 mi S on La Porte Rd. 1 plant.
32 PLU	1990/09/06	27N	12E	22	M				Keck	S		**Taylorsville**; W/side Antelope Lake Rd (USFS Rd 29N43 0.5 mi N/29N07).
32 PLU	1990/10/–	28N	07E	04	M	0.25	1.50		Horn	C		**Chester**; N/side Hwy 36 2 mi E/Chester.
32 PLU	1994/07/14	28N	11E	33	M			20	Surber	C		**Taylorsville**; Englemine Rd. 20 plants.
32 PLU	1994/09/15	22N	13E	07	M			1	Horn	C		**Blairsden**; N/side Hwy 70 1.5 mi E/C Rd. 1 plant. Redding District Report 1994.
32 PLU	1996/06/–	22N	13E	07	M			4	Horn	C		**Blairsden**; Hwy 70 1.5 mi. E/C Rd. 4 plants. Redding District Report 1996.
32 PLU	1997/08/12	23N	13E	22	M				Horn	C		**Portola**; Davis Lake Rd 2 miles N/Portola.
32 PLU	1997/08/27	23N	14E	16	M			1	Horn	C		**Portola**; Grizzly Creek Rd 2 mi N/Hwy 70. 1 plant.
32 PLU	1997/08/27	24N	13E	26	M			100	Horn	C		**Portola**; Grizzly Creek Rd 1.1 mi S/Lightning Tree CG. 100 plants.
Sacramento County												
34 SAC	1994/06/02	03N	03E	01	M			1	Breckenridge	S		**Rio Vista**; Hwy 12 0.7 mi W/San Joaquin Co line. 1 plant.
San Bernardino County												
36 SBD	1994/08/19	02N	01W	21	S			14	Miller	S	UCR	**Big Bear Lake**; 14 plants. [See also Sanders, 1966. Madroño 43(4):525-526.]
36 SBD	1997/–/–	08N	06W	23	S				Lounsbury	C		**Adelanto**; N on Hwy 395 0.3 mi S/emerg phone 397-302 near Astley Rancho.
36 SBD	1997/08/19	02N	01E	11	S			100	Acosta	S		**Big Bear Lake**; Intersection/Wendy Ave and Meadow Ln, extends into sec 14. Approx 100 plants.
San Diego County												
37 SDG	1991/06/18	13S	04E	05	S	<0.25	1.00		Pendleton	S	CDA	**Julian**; 1464 Hwy 78.
37 SDG	1991/07/01	14S	04E	05	S				Pendleton	S	RSA	**Julian**; 1464 Hwy 78 vacant Xmas tree lot.
37 SDG	1994/11/15	13S	04E	16	S	0.10	0.10		Hobgood	S	CDA	**Julian**; 4310 Toyon Mountain Rd.
37 SDG	1995/07/21	13S	04E	16	S	0.10	0.10		Quimayousie	S	CDA	**Julian**; 4310 Toyon Mountain Rd.
37 SDG	1997/08/19	10S	01E	10	S	0.10	0.10		Quimayousi	S	CDA	**Palomar Mountain**; Co Rd S6 at MP 49.
Shasta County												
45 SHA	1973/07/09	37N	01E	31	M	10.00	10.00		Haakenson	C		**Big Bend**; Big Bend.
45 SHA	1973/07/19	33N	05W	23	M			50	Spangle	C		**Summit City**; Lake Blvd. 50 plants.
45 SHA	1975/05/09	35N	02E	17	M	0.05	0.05		McBroome	C		**Burney**; Crosby Cattle Co.

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45 SHA	1975/07/24	37N	05E	30	M				Falkenstrom	C		**Fall River Mills**; Reynolds Rd.
45 SHA	1977/12/15	37N	01W	09	M			1	McBroome	C		**Big Bend**; 1.5 mi N/Iron Canyon Reservoir. 1 plant.
45 SHA	1979/09/18	31N	02E	22	M			1	Keck	S		**Viola**; Hwy 44 6 mi E/N Fk Battle Creek on S/ side. 1 plant.
45 SHA	1982/08/05	33N	04E	01	M	<0.01	<0.01		Keck	S		**Old Station**; E/side Hwy 89 100ft N/MP 5.50, 1.5 mi N/Bridge Campground.
45 SHA	1984/06/-	36N	01W	10	M				McBroome	C		**Big Bend**; Btwn Bush Bar School and Pit River Bridge.
45 SHA	1985/09/28	36N	01W	02	M	90.00	400.00		McBroome	C		**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1985/09/28	36N	01W	03	M	90.00	400.00		McBroome	C		**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1985/09/28	36N	01W	09	M	90.00	400.00		McBroome	C		**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1985/09/28	36N	01W	10	M	90.00	400.00		McBroome	C		**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1985/09/28	37N	01E	31	M	4.00	150.00		McBroome	C		**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1985/09/28	37N	01W	35	M	72.00	550.00		McBroome	C		**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1985/09/28	37N	01W	36	M	72.00	550.00		McBroome	C		**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	33N	04E	02	M	1.00	50.00		McBroome	C		**Hat Creek**; Old Gravel Pit Hwy 89.
45 SHA	1989/02/15	33N	05W	23	M	0.06	1.00		McBroome	C		**Summit City**; Lake Blvd.
45 SHA	1989/02/15	34N	04E	27	M				McBroome	C		**Hat Creek**; Hwy 89. Co rec via Kreps. Eradicated.
45 SHA	1989/02/15	35N	03E	03	M	0.06	6.00		McBroome	C		**Burney**; Hwy 299 to Johnson Park. Co rec via Kreps.
45 SHA	1989/02/15	35N	03E	09	M	0.06	6.00		McBroome	C		**Burney**; Hwy 299 to Johnson Park. Co rec via Kreps.
45 SHA	1989/02/15	35N	03E	10	M	0.06	6.00		McBroome	C		**Burney**; Hwy 299 to Johnson Park. Co rec via Kreps.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector		Af	Herbarium	Notes
45 SHA	1989/02/15	35N	03E	16	M	0.06	6.00		McBroome	C			**Burney**; Hwy 299 to Johnson Park. Co rec via Kreps.
45 SHA	1989/02/15	35N	03E	17	M	0.06	6.00		McBroome	C			**Burney**; Hwy 299 to Johnson Park. Co rec via Kreps.
45 SHA	1989/02/15	35N	03E	20	M	0.06	6.00		McBroome	C			**Burney**; Hwy 299 to Johnson Park. Co rec via Kreps.
45 SHA	1989/02/15	35N	04E	17	M				McBroome	C			**Cassel**; Doyle's corner. Co rec via Kreps. Eradicated.
45 SHA	1989/02/15	35N	05W	02	M	0.06	1.00		McBroome	C			**Lakehead**; I-5. Co rec via Kreps.
45 SHA	1989/02/15	36N	01W	02	M	90.00	400.00		McBroome	C			**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	36N	01W	03	M	90.00	400.00		McBroome	C			**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	36N	01W	09	M	90.00	400.00		McBroome	C			**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	36N	01W	10	M	90.00	400.00		McBroome	C			**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	36N	01W	13	M	90.00	400.00		McBroome	C			**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	37N	01E	31	M	4.00	150.00		McBroome	C			**Big Bend**; Pit River Canyon. Co rec via Kreps.
45 SHA	1989/02/15	37N	01W	35	M	72.00	550.00		McBroome	C			**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	37N	01W	36	M	72.00	550.00		McBroome	C			**Big Bend**; Pit River Canyon. Part of large infestation from Big Bend to Pit PH No 5, incl secs 2, 3, 9, 10.
45 SHA	1989/02/15	37N	05E	31	M				McBroome	C			**Fall River Mills**; Co rec via Kreps. Eradicated.
45 SHA	1991/06/14	38N	04W	28	M				McBroome	C			**Sweetbrier**; I-5 northbound at Sweetbrier, Sims, and Salt Creek overpasses. Redding District Report 1991.
45 SHA	1991/06/27	31N	02W	26	M				Keck	S			**Millville**, N/side Hwy 44 3.3 mi E/Bear Creek bridge
45 SHA	1992/05/28	37N	04W	17	M			50	McBroome	C	CDA		**Dunsmuir**, I-5 at Sims Rd. 50 plants.
45 SHA	1992/05/28	38N	04W	22	M			40	McBroome	C	CDA		**Castella**; I-5 at Sweetbriar Rd. 40 plants.
45 SHA	1992/09/04	36N	01W	09	M				Kreps	S			**Big Bend**; Pit River Canyon 4 mi to Pit #6 reservoir.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector		Af	Herbarium	Notes
45 SHA	1992/09/04	36N	01W	13	M				Kreps	S			**Big Bend**; Pit River Canyon 4 mi to Pit #6 reservoir.
45 SHA	1993/07/30	33N	05W	14	M				Pfeiffer	C	CDA		**Summit City**; Lake Blvd.
45 SHA	1995/07/10	33N	05W	14	M	0.10	0.10		Keck	S			**Lake Shasta City**; 1.4 mi N/Shasta Dam Blvd.
45 SHA	1996/06/06	32N	05W	32	M			1	Keck	S			**Shasta**; S/side Hwy 299 at MP20.50. 1 plant.
45 SHA	1996/07/18	37N	04W	05	M	0.01	0.01		Keck	S			**Hazel Creek**; E/side northbound I-5 near Flume Creek Exit (S/Castella). Redding District Report 1996.
45 SHA	1996/07/27	37N	01W	25	M	0.50	3.00		Kjos	C			**Big Bend**; Kosk Creek. Redding District Report 1996.
Sierra County													
46 SIE	1966/09/30	21N	13E	15	M			35	Budaj	C			**Sulphur Creek**; Hwy 89. 35 plants. Co rec #28 3/30/89.
46 SIE	1984/09/–	19N	16E	26	M				Taylor	C			**Hobart Mills**; Stampede Reservoir.
46 SIE	1991/09/11	19N	18E	07	M				Surber	C			**Verdi** (NV) ; 0.5 mi W/NV border on Dog Valley Rd.
46 SIE	1991/09/11	20N	17E	14	M	0.01	0.10		Surber	C			**Verdi** (NV) ; Forest Hunting Camp #4.
46 SIE	1996/07/23	19N	17E	02	M			1	Keck	S			**Verdi** (NV) ; Beacon Pt Rd S/side of mountain. 1 plant.
46 SIE	1997/08/05	21N	14E	33	M			1	Horn	C			**Sattley**; Approx 1.5 mi N on Co Rd A23. 1 plant.
Siskiyou County													
47 SIS	1963/08/26	43N	10W	26	M				Fuller 11155	S	CAS, CDA, RSA		**Mugginsville**; 2 mi S at Flying K Ranch, upper Quartz Valley.
47 SIS	1967/08/09	44N	03W	28	M				Deal	C			**Grass Lake**; Hwy 97 150yds S/RR crossing.
47 SIS	1967/08/15	44N	03W	28	M				Fuller 16263	S	CAS, RSA		**Grass Lake**; N/side Hwy 97 W/RR spur. 150 sq ft.
47 SIS	1967/08/15	46N	02W	36	M			1	Fuller 16261	S	CAS, CDA, RSA		**Macdoel**; 3 mi S on W/side Hwy 97. 1 plant.
47 SIS	1970/08/19	44N	03W	28	M				Schieber	C			Grass Lake; Hwy 97 near RR spur.
47 SIS	1972/06/–	43N	10W	26	M				Shaw	C			**Mugginsville**; Kerr Flying K Ranch, upper Quartz Valley.
47 SIS	1972/07/31	48N	02E	13	M			1	Massey	C			**Dorris**; Hwy 161 Lower Klamath NWR. 1 plant.
47 SIS	1974/07/16	42N	05W	20	M			1	Shaw	C	CDA		**Weed**; I-5 southbound ca 6 mi N at Weed Rest Area. 1 plant.
47 SIS	1974/07/16	48N	03E	14	M			1	Massey	C			**Tulelake**; Hwy 161 at Brownell Rd E/White Lake. 1 plant.
47 SIS	1974/07/26	40N	04W	26	M			12	Martin	C			**Mt Shasta City**; S/side Hwy 89 ca 1 mi E/I-5. 12 plants.
47 SIS	1974/08/29	41N	05W	26	M				Pitman	C			**Mt Shasta City**; SPRR W/Black Butte.
47 SIS	1976/07/28	41N	05W	25	M			1	Shaw	C			**Mt Shasta City**; N/Deetz Rd on Old Stage Rd. 1 plant.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
47 SIS	1976/08/19	41N	09W	27	M	1.00	–		Horn	C		**Etna**; Miners Creek Rd.
47 SIS	1979/09/06	38N	11W	01	M			1	Shaw	C		**Cecilville**; One plant,
47 SIS	1980/06/27	43N	04W	35	M	0.01	0.25		Joley	S		**Weed**; Hwy 97 10.4 mi E/Weed at MP 10.45 + 0.05 mi.
47 SIS	1982/10/22	47N	06W	17	M				Horn	C		**Hornbrook**; I-5 southbound along 100ft of shoulder.
47 SIS	1985/07/31	38N	11W	01	M	0.10	0.10		Janssen	C		**Cecilville**; 2 mi S/Shadow Creek CG NE/ Cecilville.
47 SIS	1986/07/12	40N	08W	11	M				Ferlatte	C		**Callahan**; Gazelle-Callahan Rd E/Hwy 3.
47 SIS	1986/07/14	40N	08W	14	M				Ferlatte	C		**Callahan**; 0.2 mi N/Mastersons Rd.
47 SIS	1986/08/01	41N	05W	13	M				Ferlatte	C		**Weed**; S/town.
47 SIS	1988/10/10	48N	11W	20	M			10	Deal	C		**Seiad Valley**; 1.25 mi S/Elliott Creek on road to Applegate, OR. 10 plants.
47 SIS	1990/07/30	42N	09W	29	M			8	Ferlatte	C		**Etna**; Howell Ave near entrance to Etna Forest park. 8 plants.
47 SIS	1990/08/09	41N	09W	10	M			2	Janssen	C	CDA	**Etna**; 1 mi N/French Cr Rd on Hwy 3. 2 plants.
47 SIS	1990/09/20	40N	04W	02	M			1	Keck	S	CDA	**Mt Shasta City**; Everitt Memorial Hwy NE/town 0.2 mi above 5-mile mark. 1 plant.
47 SIS	1991/08/13	40N	10W	08	M	0.01	0.01		Keck	S	CDA	**Sawyers Bar**; S/side Etna-Sawyers Bar Rd E/side Russian Ck Bridge at China Gulch.
47 SIS	1991/08/14	41N	10W	29	M				Keck	S		**Sawyers Bar**; Etna-Sawyers Bar Rd 0.4 mi W/MP 25. Redding District Report 1991.
47 SIS	1991/09/13	39N	02W	05	M			1	Ferlatte	C		**McCloud**; 2 mi E/McCloud on Hwy 89 S/side. 1 plant. Redding District Report 1991.
47 SIS	1992/08/11	44N	03W	28	M				Massey	C	CDA	**Grass Lake**; Maintenance Station. Klamath NF.
47 SIS	1995/08/29	40N	11W	30	M	0.01	0.01		Keck	S		**Sawyers Bar**; Halfway btwn Sawyers Bar and Little North Fork CG. Salmon R.
47 SIS	1995/08/30	40N	04W	05	M	0.10	25.00		Janssen	C		**White Horse** (Modoc Co) ; Sousa Ready Mix property. Redding District Report 1995.
47 SIS	1996/07/10	40N	04W	35	M				Steelman	C	CDA	**Dunsmuir**; I-5 at Mott Rd interchange.
47 SIS	1996/07/18	39N	04W	24	M				Keck	S		**Dunsmuir**; W/side southbound 1-5 S/Dunsmuir Bridge. Redding District Report 1996.
47 SIS	1996/10/03	38N	11W	21	M			1	Keck	S		**Cecilville**; East Fork CG, Klamath NF. 1 plant.
47 SIS	1997/05/28	46N	10W	13	M			1	Keck	S		**Horse Creek**; 2 mi E on Hwy 96. Klamath River. 1 plant.
Sonoma County												
49 SON	1992/09/16	08N	12W	30	M			10	Breckenridge	S		**Fort Ross**; W/side Hwy 1 at MP 31.00. 10 plants.
Tehama County												
52 TEH	1977/08/21	28N	05E	10	M			10	Wilson	C		**Childs Meadows**; Hwy 36 at Fire Mtn Lodge. 10 plants.

County	Date	Twp	Rng	Sec	BM	Net Ac	Grs Ac	#Plts	Collector	Af	Herbarium	Notes
52 TEH	1981/07/07	24N	03W	28	M			1	Joley	S		**Corning**; Southbound I-5 0.5 mi S/Corning Exit. 1 plant.
52 TEH	1986/08/29	29N	03E	27	M				Black	C		**Mineral**; W/Battle Creek on Hwy 36 at MP 81.00.
52 TEH	1987/08/17	29N	04E	23	M				Black	C		**Mill Creek**; S/side Hwy 36 E/side Mill Creek.
52 TEH	1990/08/02	26N	03W	04	M				Black	C		**Red Bluff**; W/side I-5 southbound 300yds S/ Riverside crossing 6yds off pavement edge. Redding District Report 1990.
52 TEH	1993/06/02	25N	03W	28	M			5	Black	C		**Corning**; I-5
Trinity County												
53 TRI	1967/08/22	33N	09W	04	M				Talbert	S		**Weaverville**; 4.1 mi. N on W/side Hwy 3.
53 TRI	1967/08/22	34N	09W	21	M				Talbert	S		**Weaverville**; 6.0 mi N on W/side Hwy 3.
53 TRI	1968/07/15	33N	09W	06	M				Borden	E	AHUC	**Weaverville**; Near airport.
53 TRI	1971/09/28	34N	09W	33	M	<0.01	<0.01		Keck	S		**Weaverville**; W/side Hwy 3 0.2 mi N/MP 35.39.
53 TRI	1976/07/14	31N	11W	06	M			1	Keck	S		**Hayfork**; E/side Big Creek Rd 1.2 mi N/Hwy 3. 1 plant.
53 TRI	1976/07/14	31N	12W	11	M			2	Keck	S		**Hayfork**; S/side Tule Creek Rd 0.2 mi W/Hwy 3. 2 plants.
53 TRI	1980/07/09	30N	11W	–	M				Joley	S		**Wildwood**; Hwy 36 0.1 mi N/MP 37.50.
53 TRI	1980/08/15	32N	08W	04	M			2	Keck	S		**Lewiston**; S/side Hwy 299 opp Buckhorn Maintenance Sta. 2 plants.
53 TRI	1993/07/28	35N	08W	04	M	0.01	0.02		Keck	S		**Wyntoon**; Hwy 3 between MP 54.00 and Long Cyn Rd.
53 TRI	1994/07/19	31N	11W	09	M	0.10	1.00		Keck	S		**Hayfork**; Hwy 3 1.3 mi S/Wildwood Rd.
53 TRI	1994/08/01	01N	06E	18	H	0.01	0.01	8	Keck	S		**Mad River**; N/side Hwy 36 300yds W/Van Duzen Rd. 8 plants.
Tuolumne County												
55 TUO	1984/08/10	04N	17E	26	M			1	Anzar	C		**Cold Springs**; Spring Gap Rd at Frazier Flat CG. 1 plant.
55 TUO	1989/10/04	02N	16E	27	M	0.01	0.01		Chambers	C		**Tuolumne**; USFS Rd 1N04 (Buchanan Rd).
55 TUO	1995/07/26	01N	17E	16	M				Xerogeanes	C		**Tuolumne City**; USFS Rd 2N11 near 5 corners. Few plants.
55 TUO	1997/09/26	01S	19E	12	M			300	Haas	F	CDA	**Mather**; USFS Rd 1S19 ±0.1 mi past MP 1.3, Stanislaus NF borders Yosemite NP. 300 plants.
55 TUO	1997/11/24	01N	17E	15	M			100	Chambers	C		**Tuolumne**; USFS Rd 2N11, 1 mi NE/1995 record. 100 plants.
Yuba County												
58 YUB	1993/07/29	18N	08E	16	M			1	Simeroth	C	CDA	**Camptonville**; Marysville Rd. 1 plant.