Parasitic Plants of California

See article starting on page 23
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The editor acknowledges the contributions of numerous individuals within this department, without whose cooperation and assistance this project would not be possible.

Funding for this publication is provided through the Cooperative Agricultural Pest Survey, Special Project #44 USDA-APHIS-PPQ

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The California Plant Pest and Disease Report, Volume 15, Numbers 1-2, was issued on September, 1996 and printed October, 1996.

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Cover illustration of sugar pine dwarf mistletoe by Sharon Harris was taken from Biology & Classification of Dwarf Mistletoes (Arceuthobium), US Dept. of Agriculture Forest Service Agriculture Handbook No. 401 by F.G. Hawksworth & D. Wiens, pg. 109; and the illustration of field dodder by Wanda Coover was taken from Weeds of California by W.W. Robbins, M.K. Bellue & W.S. Ball, pg. 349, fig. 222.
ENTOMOLOGY HIGHLIGHTS

SIGNIFICANT FINDS

MEXICAN FRUIT FLY, *Anastrepha ludens*, - (A) - Four wild Mexican Fruit Flies were trapped in San Diego County during the first part of this year. On January 5, Lewis Funk collected a sexually mature male from a McPhail trap in a sapote tree in National City. Also on January 5, an unmated female with mature eggs was found in a McPhail trap in a tangerine tree by Tim Breuninger in Chula Vista. Kent Ebsen collected a wild, sexually mature male in a McPhail trap in a grapefruit tree in Spring Valley on January 9. And in El Cajon, Joy Murray-Roseberry found a sexually immature, unmated female in a McPhail trap in an orange tree on March 1. In response to these finds, the McPhail trap density has been increased to protocol levels for new Mexican fruit fly finds.

ORIENTAL FRUIT FLY, *Bactrocera dorsalis*, - (A) - There was one Oriental fruit fly found in the first part of 1996. Michael Dishman collected a presumed sexually mature male fly in a Jackson trap in a plum tree on May 23 in Norco, Riverside County.

SUCCULENT PIT SCALE, *Asterolecanium stentae*: - (Q) - This scale insect was first noticed in Los Angeles County in 1980, where it occurred on succulents and euphorbias in a hobbyist’s garden. Later it was found in the same types of locations in Orange and San Diego Counties. These first finds were all in hobbyist’s gardens or in nurseries. However, the scale has now been found firmly established outside of these situations. On January 31, San Diego County Entomologist David Kellum found heavy infestations of this species on *Lantana* in La Mesa, San Diego County during a detection survey. The infested plants were associated with city decorative plantings. According to David, the scale can be found in other locations nearby on the same host.

AFRICANIZED HONEY BEE (AHB), *Apis m. "Africanized,"* - (A) - The following chart represents Africanized honey bee finds for the first part of 1996:

<table>
<thead>
<tr>
<th>County</th>
<th>City</th>
<th>Date</th>
<th>Host</th>
<th>Collector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperial</td>
<td>Seely</td>
<td>02/05</td>
<td>tree</td>
<td>Inay</td>
</tr>
<tr>
<td>Imperial</td>
<td>El Centro</td>
<td>03/01</td>
<td>tree</td>
<td>Inay/Estrada</td>
</tr>
<tr>
<td>Imperial</td>
<td>El Centro</td>
<td>03/02</td>
<td>tree</td>
<td>Weathersby</td>
</tr>
<tr>
<td>Imperial</td>
<td>El Centro</td>
<td>03/07</td>
<td>pipes at prison site</td>
<td>Weathersby</td>
</tr>
<tr>
<td>Riverside</td>
<td>Blythe</td>
<td>03/11</td>
<td>tree</td>
<td>Elms</td>
</tr>
<tr>
<td>Imperial</td>
<td>Calipatria</td>
<td>04/03</td>
<td>tree</td>
<td>Hodgkins/Palmera</td>
</tr>
<tr>
<td>Imperial</td>
<td>Imperial</td>
<td>04/15</td>
<td>box by a water pipe</td>
<td>Inay</td>
</tr>
<tr>
<td>Riverside</td>
<td>North Shore</td>
<td></td>
<td></td>
<td>Lothrop</td>
</tr>
</tbody>
</table>

ERRATA: The ants, *Pheidole fervens & P. meorens*, listed in CPPDR 14 (5-6) were listed as "Q" rated species and should have been listed as "C" rated species.
NEW STATE RECORDS

A THRIPS, Scirtothrips sp. -(Q)- This thrips, new to science, to California and the United States, was collected after the time frame of this issue of CPPDR. However, since there is indication that it may be a serious threat to avocados, it will be discussed briefly here. The original collection was made by a pest control advisor and by Mike Dimock, Ventura County Senior Agricultural Inspector at Saticoy, Ventura County on June 24 and again on July 8. The thrips was thought to be causing stunting of fruit and possibly a major drop of young fruit. The thrips and its actual damage potential are currently being evaluated by personnel at the University of California, Riverside and U.C. Extension.

The species is undescribed, and is close morphologically to S. aceri, native to California, and to S. abdictus, recently described from Costa Rica and Oaxaca, Mexico. Steve Nakahara, thrips expert at the USDA Systematic Entomology Laboratory in Beltsville, Maryland, has studied the new thrips very carefully and probably will describe it in the near future. Steve has found one specimen of a Scirtothrips intercepted in quarantine at San Diego from avocado leaves from Oaxaca, Mexico in 1971. Except for one minor morphological difference, this one specimen is identical to our new thrips. Considering the closeness of the morphology of the new thrips to New World forms, and considering the closeness to the form from avocados in southern Mexico, Steve believes that the species is probably native in that general area of Central America, and is probably associated with the native avocados there.

The morphology of the species will not be covered here since it is new to science, except to say that in the field it appears very similar in size to citrus thrips, S. citri, but has dark areas on the thorax and abdomen and therefore appears dusky, rather than bright lemon-yellow as does the citrus thrips.

TWO SPOTTED LEAFHOPPER, Sophonia rufofascia -(Q)- This leafhopper was collected nearly simultaneously from several locations in southern California. The actual first collection of established specimens for our records is a collection in a nursery in Commerce, Los Angeles County. The collection was made on April 1 by Michael Sium, a Los Angeles County Agricultural Inspector. He found a sizable breeding population on common guava (Psidium). This leafhopper first came to light when California quarantine inspectors began picking it up on plant material arriving from the Hawaiian Islands. At that time it was identified at CDFA as Pseudonivana rufofascia, a species originally described from Guizhou Province, China, by Kuoh and Kuoh, 1976: Acta Entomologica Sinica 26(3): 316-325. In China it is known to feed on Acacia, Citrus and Pterocarpus. Entomologists in Hawaii were unaware at that time that it was established there, and only found it after California notified them that is was being collected from there. In March of this year, Bernarr Kumashiro, Entomologist with the Hawaii Department of Agriculture, was visiting southern California on vacation. While at San Diego County at the San Diego zoo, Bernarr noticed suspicious nymphal cast skins and notified us that S. rufofascia might be established there. San Diego County Entomologist Dave Kellam was notified and he and State Nursery Services Biologist Crispin Rendon went to the zoo where they observed nymphs and adults of this leafhopper on carrotwood (Cupaniopsis anacardioides) and on orange jessamine (Murraya sp.).
An earlier collection of this leafhopper was made in Santa Barbara County at a nursery, but this infestation was considered a quarantine matter since the plants had come originally from Hawaii. For more information see the citation in the EXCLUSION section on page 18.

There are some problems with the nomenclature associated with this species. Bernarr Kumashiro has been trying to get confirmation of the original identification from specialists in Asia, where the genus is represented by numerous species. It has been placed both in *Pseudonirvana* and *Sophonia* and recently has been synonymized, possibly incorrectly, with *Nirvana orientalis*. Bernarr is still trying to resolve the synonymy issue and so we will continue to use the name *Sophonia rufofascia* for the time being.

The leafhopper has a fairly wide host range in Hawaii, and it is becoming a serious problem there, especially on some native endemic plants, particularly ferns. See the fact sheet and illustrations of this leafhopper produced by Los Angeles County Entomologist Rosser Garrison on pages 6-7.

**A LEAFHOPPER, *Empoasca* species near *guevarai* -(Q)-** Orange County Entomologist Nick Nisson collected this leafhopper from his backyard in Tustin, Orange County on April 2. This is a new state and county record for this leafhopper. A large number of specimens were taken alive from angel’s trumpet, *Brugmansia candida*, in the plant family Solanaceae.

The leafhopper matches *Empoasca guevarai* morphologically according to illustrations in the original species description [Agustín González, 1955: Ann. Inst. Biol. Mexico. 16(1):211-221]. However, two paratype specimens were obtained on loan from the Mexican National Collection at Mexico City for comparison. These two paratypes were both different and neither specimen matched the illustrations of *E. guevarai*. This problem needs to be resolved by obtaining the actual type specimen at a later date.

This leafhopper was described from specimens collected in 1954 from *Phaseolus vulgaris* at Jaloxtoc, Morelos, Mexico. The species has apparently never been recollected and identified. Its economic potential is unknown, however, its large populations on the host in Orange County and its association with beans and tomato relatives indicates that it could cause severe hopperburn injury on vegetable crops.

**A PSYLLID, *Heteropsylla* species near *flexuosa* -(Q)-** This psyllid was collected in Brea, Orange County on May 14, by Orange County Plant Pathologist Richard Tiffer. Adults and nymphs were taken from *Acacia smallii*, This is a new State and County record. It was collected once more within the county, by Nick Nisson in San Juan Capistrano. The subsequent collection was also taken off of *Acacia smallii*. A sample of the specimens was sent to Ian Hodkinson, a specialist in the United Kingdom, for a determination of the species.

**A ROOT MEALYBUG, *Rhizoecus arabicus* -(Q)-** This soil inhabiting mealybug was collected from the roots of orchids and African violets grown by a home owner and plant fancier in Cupertino, Santa Clara County. The collections were made by Stan Maggi of the Agricultural Commissioner’s office. This is a new state and county record. The mealybug also occurs in Florida, where it was collected in 1982 from a botanical garden in Sarasota. It is also known from Colombia, South America and Costa Rica in Central America.
New Agricultural Pest for Southern California

Two Spotted Leafhopper (Sophonia rufofascia) (Fig. 1, 2)

Introduction: A resident, breeding population of the Two Spotted leafhopper (Sophonia rufofascia) was found for the first time in the continental United States. Los Angeles County Agricultural Inspector Michael Sium is credited with finding larvae and adults breeding on 15 gallon potted guava plants in a nursery in the City of Commerce on 1 April 1996. Inspector Sium reported seeing larvae and adults feeding on the underside of the leaves.

On 11 April 1996, Los Angeles County Agricultural Entomologist Rosser Garrison, Supervisory inspector Dan Papilli, and Michael Sium went to the collection site to see this species. They observed it to be common; adults were flushed from the underside of leaves of the host plant. During times of sunshine, these insects were active and jumped at the slightest provocation. Larvae were less evident, but their smaller size and green coloration probably caused them to escape detection.

Like other leafhoppers, this species may be expected to have deleterious effects on their host plants due to the sucking activities by adults and larvae. Large populations might adversely affect certain ornamental and fruit crops (see under Comments).

Identification: The adult (Fig. 1) is approximately 5 mm long, primarily light green or pale yellow, and has a bold black longitudinal stripe down the center of its body. A black spot occurs at the tip of the fore wing. A beautiful red or pink flush of varying degrees borders the black dorsal stripe. Larvae (Fig. 2) are smaller, all green, and have a pair of small black spots at the tail end of the abdomen (hence the common name, Two Spotted leafhopper). Both adults and larvae are easily separated from any other species in our area by the combination of characters given above.

Life History: Nothing is recorded of the life history of this recently described species, although its development will probably be similar to other species of tropical leafhoppers. In the mild, year-round climate in the Los Angeles area, this species will probably be found to breed year-round.

Comments: This leafhopper was collected on Camellia and described from Guizhou, People's Republic of China in 1983. Larvae were beginning to be found on cut flower shipments to
California from Hawaii about ten years ago, although its specific identity was not yet known. Once adults were collected, Ray Gill, Systematic Entomologist at the California Department of Food and Agriculture in Sacramento was able to identify the species. Although rated "Q", there is no literature on its biology or known host plants. Dr. Alexander Purcell, Entomologist at the University of California, Berkeley has observed this newly introduced species in Hawaii. It has rapidly spread throughout Hawaii and has an immense host range. In recent e-mail correspondence to Garrison, he states that the feeding activity of the leafhopper is toxic to many cultivated plants including guava. It is also threatening the survival of many Hawaiian native plants some of which are important for watersheds and the survival of interdependant organisms. Its impact in Southern California is unknown but it will probably spread throughout the coastal areas of the southern California Counties. This species is almost certainly established and will probably spread to other areas wherever its host plant(s) occur.
Besides the hosts listed above for California, it has also been collected from the following: *Coffea arabica*, undetermined *Poaceae*, *Allopectus cucullatus*, *Gasteranthus acropodus*, *G. atratus*, *G. dressleri*, *G. corallinus*, *G. maculatus*, *Monopyle grandiflora*, *M. paniculata* and *Nautilocalyx punctatus*.

A SNAIL, *Xerotrichia conspurcata* -(Q)- During an agricultural quarantine inspection of imported, crated slate rock in San Pablo, Contra Costa County, the first recorded collection of this snail was made by Richard Wion on January 23. This is a new state and county record. After this find, a survey was conducted at and around this and other locations where the slate was being shipped. As a result the following collections were made: in San Mateo County Steve Olmsted collected a live adult of this snail on the slate on February 15 in Brisbane (a new county record), in a landfill in Colma on February 26, and under lumber in So. San Francisco on February 27; Tony Haro collected it in San Mateo on February 15 on dead branches of *Eucalyptus* sp. (also a county record) and on February 28 from dead wood in a yard in Redwood City; in Alameda County, Estep collected this species on chipped wood and on the ground at a recycling yard in Hayward on February 20 (new county record); in Petaluma, Sonoma County, Estep collected live adults on soil in a landscape materials yard on March 8 (new county record); and also in Contra Costa county, Steve Olmstead found the snail under cardboard at the Richmond Terminal, R3, in Richmond on March 6 and also collected it in Dublin under cardboard at a building supply on March 12.

The following information on the snail was compiled by USDA personnel:

TAXONOMY:

Phylum: Mollusca
Class: Gastropoda
Subclass: Pulmonata
Order: Stylommatophora
Family: Helicidae
Subfamily: Helicellinae
Full Name: *Xerotrichia (Helicella) conspurcata* (Draparnaud, 1801)
Synonyms: *Helicella conspurcata*

US DETECTION DATA AND/OR DISTRIBUTION MAP:

Initial Detection in US:
Location: San Pablo, CA (Contra Costa County)
Date: 23 Jan 96 (perhaps earlier)
Host: (No host specified; moved from yard of importer to adjacent field)
Collector: Richard Wion, CA Department of Food and Agriculture
Identifier: Division of Plant Industry
Sacramento, CA
Iden. Date: 1996 (by CA Department of Food and Agriculture)
QUARANTINES:

In the course of a single year, July, 1968 to June, 1969, *Helicella conspurcata* was among the snails intercepted in cargo (Godan, 1983). Godan (1983; pg 282) included *Helicella* sp. in a list of quarantine snails of special importance.

According to Dundee (1974), several species of *Helicella* have been introduced into Eastern North America: *Helicella caperata*, *Helicella elegans*, and *Helicella striata*.

This snail appears, as *Helicella conspurcata*, in a 1960 listing of snails and slugs of quarantine significance to the United States (Agricultural Research Service, 1960).

LIFE HISTORY:

Egg Stage: After mating, snails lay eggs, usually in clutches in small holes in the soil, or in cracks in rotting wood, or under logs and stones. The number of eggs in a clutch varies greatly, often 20-50 in larger species, but sometimes 100 or more. The rate of development depends on temperature, but most eggs hatch within 6 weeks. More than one clutch may be laid in a season (Kerney & Cameron, 1979).

Pre-adult Stage: Newly hatched young are like very miniature adults. Their development is direct, without metamorphosis or molting. The young grow by adding material to the leading edge of the shell, adding more whorls as they grow. Most species reach maturity in a year. The pre-adults are covered with fine, slightly curved hairs, usually worn off in adults (Kerney & Cameron, 1979).

Adult Stage: Gastropods are hermaphrodites. In the pulmonates, the spermatozoa mature before the egg cells. In the first phase, the gonad is not developed. In the second phase, the gonad produces spermatozoa. In this phase, spermatozoa is transferred to the seminal receptacle of another snail. In the third phase, the gonad releases eggs. Most pest gastropods are autosterile (Godan, 1983; pg 346). In small species, most adults die soon after breeding, so that the life-span is little more than a year. Some may survive a second season (Kerney & Cameron, 1979).

Description: 3-5 x 5-8 mm. Shell depressed above, convex below, with a low conical spine of 5-6 whorls with moderate sutures, slightly shoudered at the periphery. Umbilicus small and circular. Mouth oval, lacking internal rib. Shell opaque brown, sometimes whitish, flecked with white, and sometimes with faint darker spiral bands. Transverse ribbing marked and slightly irregular. Immatures are hairy.

Fig. 1. *Xerotricia conspurcata*. Illustration taken from Kerney & Cameron, 1979; A Field Guide to the Land Snails of Britain and North-west Europe, William Collins Sons & Co., Ltd., 288 pp.
"HOSTS":

Specimens were collected in a shipment of rosemary (*Rosmarinus officinalis*) seed (Roth & Kennedy, 1973).

DISTRIBUTION:

Europe: W. Mediterranean (Kerney & Cameron, 1979)  
Greece (Frank, 1983), possibly Cyprus (Gittenberger, 1991)  
Found in Mediterranean Region of France, not northern France.  

Africa: (?)  
N. Amer.: U.S.A. (Introduced: CA)

DAMAGE WHERE ESTABLISHED:

Byas (1972) considered this species to be “injurious” but gave no information on damage. Kerney and Cameron (1979) state that this is “a common Mediterranean species.”

PERTINENT POINTS/PREDICTED CONSEQUENCES:

Te (1976) considers the Family Helicidae to have generally a Western Palaeartic distribution.

Of the 16 species in the Subfamily Helicellinae, most are typically found in dry, open habitats such as dunes, open grassland, and rocky hillsides. However, two species, *Helicella conspurcata* and *H. apicina*, live in damper and shadier habitats. *Helicella conspurcata* is found under stones and on trees and logs, in relatively shady places (Kerney & Cameron, 1979).

Other species in the Genus *Helicella* are pests. For example, Van Dinther (1973) lists *Helicella candidans* as a commonly reported pest species. Byas lists a number of *Helicella* species as “injurious.”

REFERENCES:


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**A SNAIL**, Polygyridae sp.- (Q)- Snail samples found during a blitz of a slate-importing firm in the Bay Area were found to be “Q” rated, possibly Polygyridae (PDR# 1059527 dated 10/31/95). The crates containing these snails were due to be fumigated on 11/28/95. They were unable to be fumigated due to their proximity to a produce market.

On Monday, November 27th, while the crates were being moved to a site on the property suitable for fumigation, it was found that a large number of these snails, several hundred, exist not only under the pallets being moved but also on the two adjacent rows as well as ten feet into the field behind the company yard and behind the produce market adjacent to the property.
NEW COUNTY RECORDS

AUSTRALIAN GUM TREE WEEVIL, *Gonipterus scutellatus* -(Q)- Rosser Garrison, Los Angeles County Entomologist, collected adults of this species on *Eucalyptus globulus* in Malibu, Los Angeles County, which is a first for this county. This weevil was found during a detection survey on January 18. The species was first detected in North America in Ventura County in March of 1994. See CPPDR 13(1-2):4-7.

HARPER SCALE, *Neopinnaspis harperi* -(B)- This scale was collected in Fountain Valley, Orange County, for the first time on May 1, making it a new county record. P. Valenzuela found live and dead adults on *Quercus ilex* during a routine detection survey. The identification was determined by Nick Nisson and confirmed at the PPDC in Sacramento. This species was first detected in California at Montecito, Santa Barbara County in 1949. At that time the species was unknown to science and was described by Howard McKenzie in that year. The species was named for Bob Harper, chief of the Bureau of Entomology at that time.

The scale has only been recollected once since the original find. Joe Karl, of the Santa Barbara County Agricultural Commissioner’s Office, collected it near the Santa Barbara Museum of Natural History in 1979. The Orange County find is a considerable range extension. The scale may be more widespread than previously thought, because it is very small and blends in so well with the host bark that it is easily overlooked.

A TREEHOPPER, *Idioderma* sp. -(Q)- This treehopper has been found for the first time in Riverside, Riverside County. Adults of this species were collected from leaves of fan palm, *Washingtonia* sp. by Eldon Reeves at the county administrative center in Riverside, during a detection survey on September 25. This species was first detected in California in San Bernardino in 1988, where it was causing honeydew problems at a hotel parking lot. It was feeding on the flower spaths of Mexican fan palm, *Washingtonia robusta*. The Riverside County infestation was on small, immature trees and the exact species of *Washingtonia* is unknown at this time. This treehopper is an undescribed species, possibly native to Mexico, where the fan palm is native. For more information on the original California find see CPPDR, 1988: 7(1-4):16.

ASH PSYLLID, *Psyllopsis fraxinicola* -(C)- Adults and nymphs of this psyllid were collected on raywood ash by Michael Stewart, Supervising Agricultural Biologist, in Biggs, Butte County on May 14, and by Jim Xerogeanes, Agricultural Inspector, also on raywood ash at Talmage, Mendocino County, on May 23. For more information on the ash psyllid, please see CPPDR 6(1-2): 9-10.

HAIRY MAGGOT BLOWFLY, *Chrysomya rufifacies* -(Q)- Norm Smith, Fresno County Entomologist, found adults, larvae and pupae of this species on a dead rabbit in Sanger, Fresno County. The collection is a new county record and was made on December 1, during a residential detection survey. It was previously known from Los Angeles, Orange and San Diego Counties. For more information on the hairy maggot blowfly, refer to the citation in CPPDR 7(1-4): 13-14.
PERSEA MITE, Oligonychus perseae: -(Q)- This mite was collected for the first time in San Luis Obispo County on January 10. Mary Bianchi, with U.C. Cooperative Extension, found adults on leaves of Persea americana during a survey of an orchard in San Luis Obispo. This troublesome pest species was first detected in San Diego County in 1992. Since that time it has become generally distributed and troublesome in San Diego, Orange, Los Angeles, Ventura and Santa Barbara counties. For more information

TWO SPOTTED LEAFHOPPER, Sophonia rufofascia -(Q)- Please see citation under new state records on page 4 of this issue.

A LEAFHOPPER, Empoasca guevarai -(Q)- Please see citation under new state records on page 5 of this issue.

A PSYLLID, Heteropsylla sp. near flexusoa -(Q)- Please see citation under new state records on page 5 of this issue.

A SNAIL, Xerotrichia conspurcata -(Q)- Please see citation under new state records on page 8 of this issue.

EXCLUSION

The following "A", "B", & "Q" rated insects and those at the top of page 18 have been found infesting nursery stock or in other quarantine situations in California during the last part of 1995 and the first part of 1996. The pest listed on pages 14-17 were intercepted in quarantine.

GREEN SHIELD SCALE, Pulvinaria psidii, -(A)- This scale was found on three occasions in two nurseries in Los Angeles County. The first in Rosemead by Dan Papilli on October 24 and the second and third in Monterey Park by Dan Papilli and Mike Sium, respectively, both on October 31. The finds of these adult scales were made on several hosts including: Ficus sp., Schinus sp. and Ficus benjamina. James Wynn collected adults, nymphs, and egg masses of this same species on Citrus sinensis in a nursery in Brea, Orange County on February 15.

HERCULEANA SCALE, Clavaspis herculeana, -(A)- Lorenzo Fernandez found this adult scale on Ficus benjamina at a nursery in Costa Mesa, Orange County on January 22.

MAGNOLIA WHITE SCALE, Pseudaulacaspis cockerelli, -(A)- Mohammad Marashi collected live adult specimens of this species on Strelitzia sp. in a nursery in Gardena, Los Angeles County. The collection was made on February 1. On February 5, Suzanne Squires also found adults of this species in a nursery in Santa Barbara, Santa Barbara County on Phoenix roebelenii.

PYRIFORM SCALE, Protopulvinaria pyriformis, -(B)- This species was collected off of Laurus nobilis in a nursery in Linden, San Joaquin County by Art Moretto. The collection was made on February 7.
<table>
<thead>
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<th>Rating</th>
<th>Species</th>
<th>Common Name</th>
<th>Date</th>
<th>Origin</th>
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<td>Palmicicrus palparrum</td>
<td>palm mealybug</td>
<td>09/26/95</td>
<td>Hawaii</td>
<td>ORA</td>
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<td>Q</td>
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<td>09/29/95</td>
<td>Florida</td>
<td>SJQ</td>
<td>Schefflera arboricola</td>
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<tr>
<td>Q</td>
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<td>10/03/95</td>
<td>Costa Rica</td>
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<td>B</td>
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<td>a leafhopper</td>
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<td>CCA</td>
<td>bird of paradise/TI</td>
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<td>a phylloxora</td>
<td>10/31/95</td>
<td>Florida</td>
<td>SCL</td>
<td>Cucumis sativas</td>
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<tr>
<td>Q</td>
<td>Cocculus austissimus</td>
<td>slender soft scale</td>
<td>11/15/95</td>
<td>Hawaii</td>
<td>LAX</td>
<td>Cyrtis revoluta</td>
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<td>ORA</td>
<td>Rhapis sp.</td>
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<td>Q</td>
<td>Hypsibis ligniperda</td>
<td>a bark beetle</td>
<td>11/16/95</td>
<td>New Zealand</td>
<td>SFO</td>
<td>Pinus radiata</td>
</tr>
<tr>
<td>Q</td>
<td>Morganelia longisima</td>
<td>plumos scale</td>
<td>11/20/95</td>
<td>Florida</td>
<td>ORA</td>
<td>Ficus benjamina</td>
</tr>
<tr>
<td>Q</td>
<td>Monochamus alternatus</td>
<td>a longhorned beetle</td>
<td>11/27/95</td>
<td>China</td>
<td>SFO</td>
<td>Citrus sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Kawanaspis hikosan</td>
<td>bamboo scale</td>
<td>11/28/95</td>
<td>Florida</td>
<td>ORA</td>
<td>Anthurium sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Aleurodiscus anthurumaria</td>
<td>anthurium whitefly</td>
<td>11/29/95</td>
<td>Hawaii</td>
<td>SLO</td>
<td>Anthurium sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Anoplolepis longipes</td>
<td>longlegged ant</td>
<td>11/29/95</td>
<td>Hawaii</td>
<td>SLO</td>
<td>Rubus sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Pinaspis sirochani</td>
<td>lesser snow scale</td>
<td>11/29/95</td>
<td>Costa Rica</td>
<td>SJQ</td>
<td>Dracaena marginasa</td>
</tr>
<tr>
<td>Q</td>
<td>Pseudamphidipus fastigatus</td>
<td>campbor scale</td>
<td>11/29/95</td>
<td>Florida</td>
<td>ORA</td>
<td>Ficus benjamina</td>
</tr>
<tr>
<td>Q</td>
<td>Coptosoma xanthogramma</td>
<td>black mite</td>
<td>11/30/95</td>
<td>Hawaii</td>
<td>LAX</td>
<td>automobile</td>
</tr>
<tr>
<td>Q</td>
<td>Cryptoblabes aliena</td>
<td>phyctine pyralid moth</td>
<td>11/30/95</td>
<td>Hawaii</td>
<td>LAX</td>
<td>automobile</td>
</tr>
<tr>
<td>B</td>
<td>Dasineura balsamicola</td>
<td>balsam gall midge</td>
<td>11/30/96</td>
<td>Maine</td>
<td>MEN</td>
<td>Abies balsamea</td>
</tr>
<tr>
<td>A</td>
<td>Diaprepes sp.</td>
<td>a weevil</td>
<td>11/30/96</td>
<td>Maine</td>
<td>MEN</td>
<td>Abies balsamea</td>
</tr>
<tr>
<td>B</td>
<td>Paradipsis tumifex</td>
<td>balsam gall midge</td>
<td>11/30/96</td>
<td>Maine</td>
<td>MEN</td>
<td>Abies balsamea</td>
</tr>
<tr>
<td>Q</td>
<td>Calliphora stygia</td>
<td>an exotic blowfly</td>
<td>12/05/95</td>
<td>New Zealand</td>
<td>LAX</td>
<td>Persea americana</td>
</tr>
<tr>
<td>A</td>
<td>Aspidiotus destructor</td>
<td>coconut scale</td>
<td>12/06/95</td>
<td>Costa Rica</td>
<td>SFO</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>B</td>
<td>Dasineura balsamicola</td>
<td>balsam gall midge</td>
<td>12/06/95</td>
<td>Maine</td>
<td>MEN</td>
<td>Abies balsamea</td>
</tr>
<tr>
<td>Q</td>
<td>Neoconeophalus sp.</td>
<td>a karyid</td>
<td>12/06/95</td>
<td>Mexico</td>
<td>LAX</td>
<td>ship</td>
</tr>
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<td>Q</td>
<td>Pinaspis uniloba</td>
<td>unilided scale</td>
<td>12/08/95</td>
<td>Hawaii</td>
<td>ALA</td>
<td>Afyxia lovaiiformis</td>
</tr>
<tr>
<td>A</td>
<td>Selenaspis articulatus</td>
<td>rufous scale</td>
<td>12/08/95</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Zingiber sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Sophonia rufofascia</td>
<td>two spotted leaffhopper</td>
<td>12/08/95</td>
<td>Hawaii</td>
<td>LAX</td>
<td>Cordyline terminalis</td>
</tr>
<tr>
<td>A</td>
<td>Bactrocera latifrons</td>
<td>Malaysian fruit fly</td>
<td>12/11/95</td>
<td>---</td>
<td>ALA</td>
<td>building</td>
</tr>
<tr>
<td>Q</td>
<td>Coccus acutissimus</td>
<td>slender soft scale</td>
<td>12/11/95</td>
<td>Florida</td>
<td>ORA</td>
<td>Dimocarpus longan</td>
</tr>
<tr>
<td>Rating</td>
<td>Species</td>
<td>Common Name</td>
<td>Date</td>
<td>Origin</td>
<td>County</td>
<td>Host</td>
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<tr>
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<tr>
<td>Q</td>
<td>Ceroplastes floridensis</td>
<td>Florida wax scale</td>
<td>12/11/95</td>
<td>Florida</td>
<td>ORA</td>
<td>Dimocarpus longan</td>
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<tr>
<td>A</td>
<td>Aspidiotus destructor</td>
<td>coconut scale</td>
<td>12/13/95</td>
<td>Florida</td>
<td>SJQ</td>
<td>areca palm</td>
</tr>
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<td>A</td>
<td>Aspidiotus destructor</td>
<td>coconut scale</td>
<td>12/13/95</td>
<td>Florida</td>
<td>SJQ</td>
<td>areca palm</td>
</tr>
<tr>
<td>Q</td>
<td>Cerataphis sp.</td>
<td>an aphid</td>
<td>12/14/95</td>
<td>Hawaii</td>
<td>SFO</td>
<td>leaf</td>
</tr>
<tr>
<td>A</td>
<td>Dasineura balsamicoles</td>
<td>balsam fir gall midge</td>
<td>12/14/95</td>
<td>Minnesota</td>
<td>MEN</td>
<td>Abies sp.</td>
</tr>
<tr>
<td>B</td>
<td>Paradiplosis tumifex</td>
<td>balsam gall midge</td>
<td>12/14/95</td>
<td>Minnesota</td>
<td>MEN</td>
<td>Abies sp.</td>
</tr>
<tr>
<td>A</td>
<td>Aspidiotus destructor</td>
<td>coconut scale</td>
<td>12/15/95</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>B</td>
<td>Paradiplosis tumifex</td>
<td>balsam gall midge</td>
<td>12/16/95</td>
<td>Minnesota</td>
<td>MEN</td>
<td>Abies sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Elixothrips brevisetis</td>
<td>a schefflera thrips</td>
<td>12/21/95</td>
<td>Hawaii</td>
<td>SLO</td>
<td>Schefflera arboricola</td>
</tr>
<tr>
<td>Q</td>
<td>Coptosoma xanthographama</td>
<td>black stink bug</td>
<td>12/28/95</td>
<td>Hawaii</td>
<td>SFO</td>
<td>lei</td>
</tr>
<tr>
<td>Q</td>
<td>Chrysodeixis eriosoma</td>
<td>green garden looper</td>
<td>01/03/96</td>
<td>Hawaii</td>
<td>SCL</td>
<td>hunkay (mint)</td>
</tr>
<tr>
<td>A</td>
<td>Selenaspis articulatus</td>
<td>rufous scale</td>
<td>01/04/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>areca palm</td>
</tr>
<tr>
<td>A</td>
<td>Aspidiotus destructor</td>
<td>coconut scale</td>
<td>01/05/96</td>
<td>Costa Rica</td>
<td>LAX</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Aspidiotus excisus</td>
<td>aglaonema scale</td>
<td>01/05/96</td>
<td>Florida</td>
<td>SJQ</td>
<td>Aglaonema sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Pseudococcus longispina</td>
<td>trilobe scale</td>
<td>01/08/96</td>
<td>Florida</td>
<td>SJQ</td>
<td>Ficus benjamina</td>
</tr>
<tr>
<td>Q</td>
<td>Hemiberlesia ocellata</td>
<td>an armored scale</td>
<td>01/09/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>B</td>
<td>Dysmicoccus alazon</td>
<td>alazon mealybug</td>
<td>01/10/96</td>
<td>Mexico</td>
<td>SFO</td>
<td>Alpinia sp.</td>
</tr>
<tr>
<td>B</td>
<td>Ferrisia virgata</td>
<td>striped mealybug</td>
<td>01/10/96</td>
<td>Mexico</td>
<td>SFO</td>
<td>Alpinia sp.</td>
</tr>
<tr>
<td>B</td>
<td>Nezara viridula</td>
<td>southern green stink bug</td>
<td>01/11/96</td>
<td>Hawaii</td>
<td>SFO</td>
<td>malungai</td>
</tr>
<tr>
<td>B</td>
<td>Diaphania nitidalis</td>
<td>pickleworm</td>
<td>01/16/96</td>
<td>Dom. Rep.</td>
<td>SMT</td>
<td>Cucumis sativus</td>
</tr>
<tr>
<td>Q</td>
<td>Dysdarcy sp.</td>
<td>a stainer</td>
<td>01/16/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Sybra alternans</td>
<td>a longhorned beetle</td>
<td>01/18/96</td>
<td>Hawaii</td>
<td>LAX</td>
<td>chinese cilantro</td>
</tr>
<tr>
<td>B</td>
<td>Diaphania nitidalis</td>
<td>pickleworm</td>
<td>01/19/96</td>
<td>Dom. Rep.</td>
<td>SMT</td>
<td>Cucumis sativus</td>
</tr>
<tr>
<td>Q</td>
<td>Morganella longispina</td>
<td>plumose scale</td>
<td>01/22/96</td>
<td>Florida</td>
<td>ORA</td>
<td>Ficus benjamina</td>
</tr>
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<td>B</td>
<td>Diaphania nitidalis</td>
<td>pickleworm</td>
<td>01/24/96</td>
<td>Dom. Rep.</td>
<td>SMT</td>
<td>Cucumis sativus</td>
</tr>
<tr>
<td>A</td>
<td>Selenaspis articulatus</td>
<td>rufous scale</td>
<td>01/26/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>areca palm</td>
</tr>
<tr>
<td>A</td>
<td>Selenaspis articulatus</td>
<td>rufous scale</td>
<td>01/30/96</td>
<td>Costa Rica</td>
<td>SFO</td>
<td>Citrus aurantifolia</td>
</tr>
<tr>
<td>Q</td>
<td>Aonidiella orientalis</td>
<td>oriental scale</td>
<td>02/05/96</td>
<td>Florida</td>
<td>ORA</td>
<td>Strelitzia sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Hemiberlesia diffinis</td>
<td>diffinis scale</td>
<td>02/05/96</td>
<td>Florida</td>
<td>ORA</td>
<td>Ficus benjamina</td>
</tr>
<tr>
<td>Q</td>
<td>Morganella longispina</td>
<td>plumose scale</td>
<td>02/05/96</td>
<td>Florida</td>
<td>ORA</td>
<td>Ficus benjamina</td>
</tr>
<tr>
<td>Q</td>
<td>Sybra alternans</td>
<td>a longhorned beetle</td>
<td>02/05/96</td>
<td>Hawaii</td>
<td>SCL</td>
<td>Musa x paradisiaca</td>
</tr>
<tr>
<td>A</td>
<td>Hemiberlesia palmae</td>
<td>tropical palm scale</td>
<td>02/06/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Salayut</td>
</tr>
<tr>
<td>Q</td>
<td>Chrysodeixis eriosoma</td>
<td>green garden looper</td>
<td>02/07/96</td>
<td>Hawaii</td>
<td>SCL</td>
<td>Salayut</td>
</tr>
<tr>
<td>Rating</td>
<td>Species</td>
<td>Common Name</td>
<td>Date</td>
<td>Origin</td>
<td>County</td>
<td>Host</td>
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<tr>
<td>B</td>
<td>Diaphania nitidalis</td>
<td>pickleworm</td>
<td>02/08/96</td>
<td>Dom. Rep.</td>
<td>SMT</td>
<td>Cucumis sativus</td>
</tr>
<tr>
<td>Q</td>
<td>Chrysoeleixis eriosoma</td>
<td>green garden looper</td>
<td>02/09/96</td>
<td>Hawaii</td>
<td>ORA</td>
<td>Cilifoliage</td>
</tr>
<tr>
<td>Q</td>
<td>Geotoma pygmaeus</td>
<td>a burrowing bug</td>
<td>02/09/96</td>
<td>Hawaii</td>
<td>KRN</td>
<td>Zingiber sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Oceanides sp.</td>
<td>a lygaid bug</td>
<td>02/10/96</td>
<td>Hawaii</td>
<td>LAX</td>
<td>Zingiber sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Oxydema longula</td>
<td>a weevil</td>
<td>02/19/96</td>
<td>Hawaii</td>
<td>SMT</td>
<td>cut flowers</td>
</tr>
<tr>
<td>Q</td>
<td>Hemiberlesia ocellata</td>
<td>an armored scale</td>
<td>02/20/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Paracarsidara dugesii</td>
<td>a psyllid</td>
<td>02/21/96</td>
<td>Mexico</td>
<td>LAX</td>
<td>Ocimum sp.</td>
</tr>
<tr>
<td>A</td>
<td>Clavus herculeana</td>
<td>herculeana scale</td>
<td>02/26/96</td>
<td>Hawaii</td>
<td>ORA</td>
<td>Plumeria sp.</td>
</tr>
<tr>
<td>A</td>
<td>Hemiberlesia palmae</td>
<td>tropical palm scale</td>
<td>02/27/96</td>
<td>Hawaii</td>
<td>ORA</td>
<td>bromeliads</td>
</tr>
<tr>
<td>Q</td>
<td>Sophonia rufa fascia</td>
<td>two spotted leafhopper</td>
<td>02/27/96</td>
<td>Hawaii</td>
<td>ORA</td>
<td>Dracaena draco</td>
</tr>
<tr>
<td>Q</td>
<td>Orchidophilius sp.</td>
<td>a weevil</td>
<td>02/29/96</td>
<td>Hawaii</td>
<td>LAX</td>
<td>orchids</td>
</tr>
<tr>
<td>Q</td>
<td>Chlorogonia ultima</td>
<td>a sharpshooter</td>
<td>03/04/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Ananas comosus</td>
</tr>
<tr>
<td>Q</td>
<td>Rhizoecus hibiscus</td>
<td>a root mealybug</td>
<td>03/04/96</td>
<td>Florida</td>
<td>LAX</td>
<td>Syagus romanoffiana</td>
</tr>
<tr>
<td>Q</td>
<td>Rhizoecus hibiscus</td>
<td>a root mealybug</td>
<td>03/05/96</td>
<td>Florida</td>
<td>LAX</td>
<td>Ravenia rivularis</td>
</tr>
<tr>
<td>Q</td>
<td>Helicoverpa hawaiensis</td>
<td>Hawaiian budmoth</td>
<td>03/06/96</td>
<td>Hawaii</td>
<td>LAX</td>
<td>Ravenia vivuliria</td>
</tr>
<tr>
<td>B</td>
<td>Opae sp.</td>
<td>a snail</td>
<td>03/06/96</td>
<td>Florida</td>
<td>LAX</td>
<td>Ravenia vivuliria</td>
</tr>
<tr>
<td>Q</td>
<td>Rhizoecus hibiscus</td>
<td>a root mealybug</td>
<td>03/06/96</td>
<td>Florida</td>
<td>LAX</td>
<td>Ravenia vivuliria</td>
</tr>
<tr>
<td>Q</td>
<td>Rhizoecus hibiscus</td>
<td>a root mealybug</td>
<td>03/06/96</td>
<td>Florida</td>
<td>LAX</td>
<td>Ravenia vivuliria</td>
</tr>
<tr>
<td>B</td>
<td>Nezara viridula</td>
<td>southern green stink bug</td>
<td>03/11/96</td>
<td>Hawaii</td>
<td>SCR</td>
<td>Ocimum sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Aleurocerus palmae</td>
<td>palm whitefly</td>
<td>03/12/96</td>
<td>Florida</td>
<td>SAC</td>
<td>Spathiphyllum sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Zachrysta provioria</td>
<td>a snail</td>
<td>03/12/96</td>
<td>Florida</td>
<td>SCL</td>
<td>Plumeria sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Coccus viridis</td>
<td>green scale</td>
<td>03/13/96</td>
<td>Hawaii</td>
<td>SBA</td>
<td>Ocimum sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Aphiaca janata</td>
<td>a noctuid moth</td>
<td>03/15/96</td>
<td>Hawaii</td>
<td>SFO</td>
<td>Ocimum sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Coccus acutissimus</td>
<td>slender soft scale</td>
<td>03/20/96</td>
<td>Hawaii</td>
<td>LAX</td>
<td>Cycas sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Ararcerus sp.</td>
<td>a bean weevil</td>
<td>03/26/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Philephedra tuberculosa</td>
<td>a soft scale</td>
<td>04/03/96</td>
<td>Florida</td>
<td>SMT</td>
<td>Spathiphyllum sp.</td>
</tr>
<tr>
<td>A</td>
<td>Ceroplastes rubens</td>
<td>red wax scale</td>
<td>04/04/96</td>
<td>Florida</td>
<td>LAX</td>
<td>Euphorbia longana</td>
</tr>
<tr>
<td>Q</td>
<td>Adoretus sinaic</td>
<td>Chinese rose beetle</td>
<td>04/05/96</td>
<td>Hawaii</td>
<td>SCR</td>
<td>Ocimum sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Dymicoccus mackenziei</td>
<td>McKenzie mealybug</td>
<td>04/05/96</td>
<td>Hawaii</td>
<td>MAD</td>
<td>Tillandia caput</td>
</tr>
<tr>
<td>B</td>
<td>Parlatoria pergandii</td>
<td>chaff scale</td>
<td>04/09/96</td>
<td>Taiwan</td>
<td>SFO</td>
<td>Citrus sinensis</td>
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<tr>
<td>Q</td>
<td>Philephedra tuberculosa</td>
<td>a soft scale</td>
<td>04/09/96</td>
<td>Florida</td>
<td>SMT</td>
<td>Spathiphyllum sp.</td>
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<tr>
<td>Q</td>
<td>Dymicoccus sp.</td>
<td>a mealybug</td>
<td>04/11/96</td>
<td>Mexico</td>
<td>ORA</td>
<td>Alpinia purpurata</td>
</tr>
<tr>
<td>Q</td>
<td>Gyponana germani</td>
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<td>Hawaii</td>
<td>ORA</td>
<td>Heliconia sp.</td>
</tr>
<tr>
<td>Rating</td>
<td>Species</td>
<td>Common Name</td>
<td>Date</td>
<td>Origin</td>
<td>County</td>
<td>Host</td>
</tr>
<tr>
<td>--------</td>
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</tr>
<tr>
<td>A</td>
<td>Selenaspidus articulatus</td>
<td>rufous scale</td>
<td>04/11/96</td>
<td>Ecuador</td>
<td>LAX</td>
<td>Zingiber sp.</td>
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<tr>
<td>A.</td>
<td>Aspidiotus destructor</td>
<td>coconut scale</td>
<td>04/12/96</td>
<td>Cent. America</td>
<td>LAX</td>
<td>Musa sp.</td>
</tr>
<tr>
<td>Q</td>
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<td>pustule scale</td>
<td>04/18/96</td>
<td>Florida</td>
<td>ORA</td>
<td>molix</td>
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<tr>
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<td>Dysmicoccus sp.</td>
<td>a mealybug</td>
<td>04/23/96</td>
<td>Mexico</td>
<td>SFO</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Sophonia rufosica</td>
<td>a leaffopper</td>
<td>04/23/96</td>
<td>Hawaii</td>
<td>SBA</td>
<td>Cadyline terminalis</td>
</tr>
<tr>
<td>Q</td>
<td>Hylurgus lingiperda</td>
<td>a bark beetle</td>
<td>04/29/96</td>
<td>New Zealand</td>
<td>SFO</td>
<td>lumber (green)</td>
</tr>
<tr>
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<td>a mealybug</td>
<td>05/03/96</td>
<td>Mexico</td>
<td>ORA</td>
<td>Alpinia purpurata</td>
</tr>
<tr>
<td>Q</td>
<td>Thrips hawathiensis</td>
<td>Hawaiian flower thrips</td>
<td>05/09/96</td>
<td>Hawaii</td>
<td>SLO</td>
<td>orchids</td>
</tr>
<tr>
<td>Q</td>
<td>Aleurosulus anthuricola</td>
<td>anthurium whitefly</td>
<td>05/11/96</td>
<td>Hawaii</td>
<td>SLO</td>
<td>Anthurium sp.</td>
</tr>
<tr>
<td>Q</td>
<td>Chrysodeixis erosoma</td>
<td>green garden looper</td>
<td>05/11/96</td>
<td>Hawaii</td>
<td>SLO</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Sophonia rufosica</td>
<td>two spotted leaffopper</td>
<td>05/11/96</td>
<td>Hawaii</td>
<td>SLO</td>
<td>tropical foliage</td>
</tr>
<tr>
<td>B</td>
<td>Lamellaxis sp.</td>
<td>a snail</td>
<td>05/13/96</td>
<td>Florida</td>
<td>ORA</td>
<td>Schefflera arboricola</td>
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<tr>
<td>Q</td>
<td>Dysmicoccus sp.</td>
<td>a mealybug</td>
<td>05/26/96</td>
<td>Mexico</td>
<td>ORA</td>
<td>Alpinia purpurata</td>
</tr>
</tbody>
</table>
McKENZIE MEALYBUG, *Dysmicoccus mackenziei*, -(Q)- Dead adults of this mealybug were collected from a shipment of *Tillandsia caput* to a nursery in Coursegold, Madera County on April 5 by Bruce Rohn. This mealybug is commonly encountered on imported tillandsias.

TWO SPOTTED LEAFHOPPER, *Sophonia rufofascia*, -(Q)- Live adults, nymphs, and eggs of this leafhopper were found by Suzanne Squires on February 29, in Carpinteria, Santa Barbara County. The infested host, *Phoenix roebelenii*, was treated at the nursery. The plants had originated in Hawaii and this species is frequently received on plant material from there. This leafhopper now appears to be established in the state, see citation under New State Records.

COFFEE BEAN WEEVIL, *Araecerus fasciculatus* -(Q)- This weevil species has been found for the first time in Los Angeles County, on October 3. Cardenas collected a single live adult in Los Angeles on *Prunus persica*. Since the collection was a single find, it is not known whether this insect is actually established here, therefore the find is being considered an Exclusion incident for the time being.

**BORDER STATIONS**

The following interceptions were made at border stations during the latter part of 1995 and the first few months of 1996.

UNDESCRIBED WEEVIL - On September 16, 1995, at the Blythe border station, Steve Klingenmeier intercepted a fruit native to Mexico called papache, *Randia echinocarpa*, from a licensed Mexican auto on its way to Los Angeles. Several live adult weevils from the subfamily Zygopinae were found when the fruit was cut open. This is not only an undescribed species, but possibly also an undescribed genus.

ZEBRA MUSSEL, *Dreissena polymorpha* - On February 3, adults of this species were found by Bill Gresick, at Vidal, on the hull of a boat on its way to Cupertino, making it the seventh confirmed zebra mussel interception at border stations. The eighth was found in Yermo, on the drive shaft of a boat, on April 5, by Alex Mesa. The boat was on its way to Ventura. Both of these boats were returning from trips to Lake Michigan.

CITRUS PEEL MINER, *Marmara* sp. - An unusually large number of larvae of this species have been collected at the border stations between December, 1995 and May, 1996. A total of 718 interception were made. The hosts of homegrown and commercially grown fruit included grapefruit, oranges, lemons, tangerines, and tangelos. These fruits had various origins including: Arizona, California, Colorado, Florida, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, as well as Canada and Mexico.

GRACILLARIID MOTH, probably *Marmara* sp. - Steve Klingenmeier found larvae of this species tunneling under the skins of uncertified mangoes in a commercial shipment from Nicaragua. The interception was made on March 20, at the Blythe border station. This is the
same genus but a different species than the miner that attacks citrus fruit. This is the first recorded collection of this species at a California border station.

**ANIMAL PESTS** - In December, 1995 the following significant interceptions of animal pests and the number of times they were collected were as follows: ferret (27), gerbil (4), hawk (1), hedgehog (3), and monk parakeet (7).

The following lists the rated pests found at the border stations for the month of December, 1995. This is an amazing array of pest species considering the time of year, and indicates the level of risk agricultural pests being transported into California from other states presents.

<table>
<thead>
<tr>
<th>Insects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyrthosiphon sp. (aphid)</td>
</tr>
<tr>
<td>Aligia sp. (leafhopper)</td>
</tr>
<tr>
<td>Anthonomus grandis (boll weevil)</td>
</tr>
<tr>
<td>Aonidiella orientalis (Oriental scale)</td>
</tr>
<tr>
<td>Apterona helix (garden bagworm)</td>
</tr>
<tr>
<td>Araecerus fasciculatus (coffee bean weevil)</td>
</tr>
<tr>
<td>Arctidiaceae (woollybears)</td>
</tr>
<tr>
<td>Unaspis yanonensis (arrowhead scale)</td>
</tr>
<tr>
<td>Aspidiotus destructor (coconut scale)</td>
</tr>
<tr>
<td>Gypsophila paniculata (Baby’s breath)</td>
</tr>
<tr>
<td>Camponotus abdom. floridanus (Florida carpenter ant)</td>
</tr>
<tr>
<td>Camponotus sp. (a carpenter ant)</td>
</tr>
<tr>
<td>Ceratitus capitata (Mediterranean fruit fly)</td>
</tr>
<tr>
<td>Curculio caryae (pecan weevil)</td>
</tr>
<tr>
<td>Curculio sp. (a weevil)</td>
</tr>
<tr>
<td>Cydia sp. (a fruit worm)</td>
</tr>
<tr>
<td>Cucuta sp. (dodder)</td>
</tr>
<tr>
<td>Empoasca sp. (leafhopper)</td>
</tr>
<tr>
<td>Euxoa sp. (cutworm)</td>
</tr>
<tr>
<td>Fulgoroidea (planthopper nymphs)</td>
</tr>
<tr>
<td>Genaparlatoria pseudaspidotus (vanda orchid scale)</td>
</tr>
<tr>
<td>Cydia cariaca (hickory shuckworm)</td>
</tr>
<tr>
<td>Ischnaspis longirostris (black thread scale)</td>
</tr>
<tr>
<td>Cardaria chalepensis (lens-podded hoary cress)</td>
</tr>
<tr>
<td>Lepidosaphes sp. (an armored scale)</td>
</tr>
<tr>
<td>Marmorata sp. (a citrus peel miner)</td>
</tr>
<tr>
<td>Meloidogyne sp. (root-knot nematode)</td>
</tr>
<tr>
<td>Pectinophora gossypii (pink bollworm)</td>
</tr>
<tr>
<td>Pheidole sp. (an ant)</td>
</tr>
<tr>
<td>Pomerina (a primitive ant)</td>
</tr>
<tr>
<td>Pseudaulacaspis cockerelli (magnolia white scale)</td>
</tr>
<tr>
<td>Rhagoletis pomonella (apple maggot)</td>
</tr>
<tr>
<td>Rhyacionia bouliana (European pine shoot moth)</td>
</tr>
<tr>
<td>Solenopsis invicta (red imported fire ant)</td>
</tr>
<tr>
<td>Solenopsis sp. (a fire ant)</td>
</tr>
<tr>
<td>Tapinoma melanocephalum (black headed ant)</td>
</tr>
<tr>
<td>Tapinoma sp. (an ant)</td>
</tr>
<tr>
<td>Technomyrmex albipes (white footed ant)</td>
</tr>
<tr>
<td>Tetrariorium sp. (an ant)</td>
</tr>
<tr>
<td>Thysanofiorinia nepheili (longan scale)</td>
</tr>
<tr>
<td>Solanum eleagnifolium (White horsenettle)</td>
</tr>
<tr>
<td>Zygopinae (a weevil)</td>
</tr>
</tbody>
</table>
PLANT PATHOLOGY HIGHLIGHTS

Karnal Bunt Project Summary for 1996

July 23, 1996

The California wheat harvest in an area suspected to be infested with karnal bunt has ended. Results from a five month program of intensive survey for karnal bunt showed the disease was not widespread. The positive fields represent less than $\frac{3}{100}$ of the total acreage in the quarantine area (3,389 acres out of a total of 129,956).

The positive fields are located in two small areas. The majority of the fields (62) are in the Palo Verde Valley near Blythe in Riverside County. Seven additional fields, totaling 41 acres, were discovered in the Bard/Winterhaven area of Imperial County, on the Arizona border.

Background

In March of this year, spores recovered from eight California grain storage facilities were identified as being karnal bunt. It was also discovered that several fields had been planted using contaminated seed from Arizona.

Karnal bunt is a disease of wheat that may affect both the quality of the grain and the yield. It has no human health impacts but would have a major impact on our export markets. Fifty countries prohibit or regulate grain contaminated with Karnal bunt.

California wheat was valued at $141 million in 1995. This year the wheat industry estimates that the value has doubled due to crop shortages elsewhere in the U.S.

A quarantine was placed in April on all of Imperial and part of Riverside Counties. The quarantine area is currently 6,000 square miles and encompasses 129,956 acres of wheat. The purpose of a quarantine is to prevent the spread of the disease to non-infected portions of the state.

Project Components

California wheat grown outside the quarantine area is not regulated in any way. Inside the quarantine area, anyone who grows, handles, or transports wheat must sign a compliance agreement that limits the movement of wheat and associated equipment, trucks and rail cars unless proper safeguards are taken.

As part of the quarantine effort, every field inside the quarantine area has been tested for karnal bunt prior to harvest. There are 2,326 fields. Of these, 69 tested positive for the disease.

Each remaining grain storage and handling facility in the quarantine area was tested to ensure that harvested grain was stored in clean facilities. Over 300 samples taken from these facilities were negative.

As an additional safeguard, every rail car or truck carrying wheat that has tested negative in the field is tested again before moving from the quarantine area. Of 1,471 rail cars tested, fourteen were positive for karnal bunt (ten from Riverside and four from Imperial), less than .1% of the cars tested. Infected grain must remain in the quarantine area.
Wheat grown for seed in the quarantine area is subjected to an even more rigorous testing program. A single sample from Imperial County out of 760 seed samples tested overall was positive for karnal bunt. This seed will not be allowed to move from the quarantine area.

National Survey

California is testing wheat from every wheat growing county (33 total) in the state as part of a national karnal bunt survey. Over 210 samples from 25 counties tested so far have been negative.

Although a single sample from the San Joaquin Valley did test positive, an investigation at the field locations represented by the sample uncovered no infected fields. Over 479 samples taken from truckloads of wheat and other sources in the suspect area were negative for karnal bunt. Field surveys are scheduled for the 1997 growing season.

PROJECT STATISTICS AT A GLANCE

<table>
<thead>
<tr>
<th>Current Quarantine Area</th>
<th>Imperial Co. (approx. 4,175 sq. mi.)</th>
<th>Eastern Riverside Co. (approx. 1,825 sq. ft.)</th>
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<tbody>
<tr>
<td>Acres of Wheat in Quarantine Area</td>
<td>114,514</td>
<td>15,442</td>
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<tr>
<td>Number of Fields Sampled (2,326 total fields)</td>
<td>positive 7</td>
<td>negative 1,989</td>
</tr>
<tr>
<td>Acreage of Fields Sampled (129,956 total acres)</td>
<td>positive 41</td>
<td>negative 114,473</td>
</tr>
<tr>
<td>Number of Rail Cars Sampled (1,471 total rail cars)</td>
<td>positive 4</td>
<td>negative 1,349</td>
</tr>
<tr>
<td>Number of Facilities Confirmed Positive (decontamination in process)</td>
<td></td>
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The following pages represent a complete check list for the parasitic plants of California. This includes mistletoe, dodder, and a number of other interesting and unusual plant forms. The work was compiled by CDFA Plant Pathologist Tim Tidwell, as part of a strong personal interest in the subject. This list will be in two parts; the last part will be published in the next issue. This issue contains the introductory and preliminary information, along with the alphabetical listing by parasitic species. The listing in next issue will be alphabetically by host.
INDEX OF PHANEROGAMIC PARASITES OF CALIFORNIA

1996

T. E. Tidwell

STATE OF CALIFORNIA
DEPARTMENT OF FOOD AND AGRICULTURE
SACRAMENTO, CALIFORNIA
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PREFACE

In literature one occasionally finds the phanerogamic, or seed-bearing parasitic plants, referred to as “parasitic weeds.” But this terminology sells them short. These plants are more than just weeds. The interactions of these unique plant pathogens with their hosts are so intriguing that they command the interest of not only the weed scientist, but also the plant pathologist, the taxonomist, the plant anatomist, and the plant physiologist.

Worldwide, more than 2,500 species of flowering plants are known to live as parasites on other plants. Some of these parasites have chlorophyll and roots and are capable of producing their own food through photosynthesis, but still depend on their hosts for certain minerals and some organic compounds. Others, such as the leafy mistletoes, have chlorophyll in green leaves and stems, and therefore have the ability to manufacture their own food from carbon dioxide and water, but have no true roots of their own. Consequently, these parasites must depend on their hosts for their supply of water and minerals. Still other phanerogamic parasites have little or no chlorophyll, no roots, and are entirely dependent on their host.

The host ranges of phanerogamic parasites are relatively wide for some species, and relatively restricted for others. In this index one will also find references to one parasitic plant parasitizing another, and occasionally even a reference to a parasitic plant actually parasitizing another plant of the same species (“autoparasitism”). In a few instances, usually with herbarium material, known root parasites were “presumed” to be parasitic on a particular host. This was based on the fact that when the plant material was collected, actual root-to-root connections were not confirmed, but there were no other hosts nor parasites present in the vicinity. Such records are noted in this index by an asterisk.

This index is a collection of data for California. Information was compiled from various journals and other publications, from diagnostic laboratory records, and from herbarium records. It makes no attempt to authenticate the records cited, but rather to merely report them, along with the source of the information. It is not meant to be exhaustive, but rather representative, of the phanerogamic parasites found in California.

ACKNOWLEDGEMENTS

Sincere thanks is extended to Andy Sanders and Barbara Pitzer of the U.C. Riverside Department of Botany’s Arboretum/Herbarium, to Walter Appleby and Elizabeth Neese of the Herbarium of the University of California at Berkeley, to Dr. Robert Scharpf and the late Dr. Frank Hawksworth of the USFS, to Dr. Doug Barbe of the California Department of Food and Agriculture (CDFA) as well as the staff of the CDFA seed laboratory. Thanks is also extended to Dr. Barbe and to Dr. Conrad Krass for their reviews of the index and helpful comments.
REFERENCES

The sources of the data used, and the way they are cited in this index, are as follows:

“AMERICAN JOURNAL OF BOTANY:” A journal published by the Botanical Society of America, Iowa State University, Ames, Iowa.


“BAKER HERBARIUM:” Kenneth Baker Herbarium, California Department of Food and Agriculture, Sacramento, CA, 95814.


“CDFA BULLETIN:” Bulletin of the California Department of Food and Agriculture. Published by the California Department of Food & Agriculture, Sacramento, CA 95814.

“CDFA PLANT PATHOLOGY:” Diagnostic records of the Plant Pathology Laboratory of the California Department of Food and Agriculture, 1220 N Street, Sacramento, CA, 95814.

“CDFA BOTANY HERBARIUM:” Records of the Botany Laboratory herbarium of the California Department of Food and Agriculture, 1220 N Street, Sacramento, CA, 95814.

“CDFA SEED LAB HERBARIUM:” Records of the Seed Laboratory herbarium of the California Department of Food and Agriculture, 1220 N Street, Sacramento, CA, 95814.

“EL ALISO:” (also known as Aliso) A journal published by Rancho Santa Ana Botanic Garden, Claremont, CA 91711.


“HILGARDIA:” A journal published by the California Agricultural Experiment Station, University of California, Berkeley.


“JOURNAL OF ARBORICULTURE:” A journal published by the International Society of Arboriculture, Urbana, IL.

“MADRÓÑO:” A journal published by the California Botanical Society, Berkeley, CA.


"PHYTOPATHOLOGY:" A journal published by the American Phytopathological Society, St. Paul, MN, 55121.

"PLANT DISEASE:" A journal published by the American Phytopathological Society, St. Paul, MN, 55121.

"PLANT DISEASE REPORTER:" A journal published (until 1980) by the USDA Agricultural Research Center, Beltsville, MD, 20705.


"UCB HERBARIUM:" Herbarium records of the University of California, Berkeley.

"UCR HERBARIUM:" Herbarium records of the University of California, Riverside.


**TAXONOMIC REFERENCES**

The following sources were consulted for the taxonomic names used in this index.


**DWARF MISTLETOES**

*Arceuthobium* spp.

Dwarf mistletoes are flowering plants that are parasitic on conifers. They occur in all parts of the world where conifers grow, but are most prevalent and most damaging in western North America, where some 28 of the 32 known taxa may be found. Most species of dwarf mistletoes are confined to a specific host, or a relatively restricted taxonomic group of hosts.

Dwarf mistletoes are considered "true parasites" in that they possess very little chlorophyll, and consequently are dependent on their hosts for water, minerals, and food. Dwarf mistletoes damage their hosts primarily by causing swelling and deformity of host branches, and excessive lateral bud and shoot formation (a "witches broom"). These brooms drain off vital nutrients otherwise used to grow productive wood and foliage. They grow to substantial size and weight, and may cause branch failure, creating hazards in public areas such as campgrounds. Heavy infection also predisposes trees to wind-throw and breakage, as well as to attack from insects and plant pathogens. Infected trees may be severely stunted, resulting in height reductions of 50 to 80 %. Dwarf mistletoe-infected trees may also be severely deformed, thus reducing timber quality by the excessive knots, and the spongy, weak, swollen branches. Dwarf mistletoes are capable of killing young trees and saplings.

The foliage of dwarf mistletoes is inconspicuous. The leaves are somewhat scale-like, and are the same color as the stem. Shoot length ranges from 1.5 cm to 10 cm, depending on the species.
Dwarf mistletoe seeds are explosively “shot” from female plants for distances up to 20 meters. Needles of neighboring trees intercept the sticky seeds in flight, where the seeds remain until rain water lubricates the seeds enough to slide down to a branch. When seeds come in contact with relatively new branch tissue (usually 5 years old or less) of a susceptible host species, a germ tube grows along the bark until it meets a bud or leaf base. The tissue flattens out on the bark surface and forms a “holdfast” structure, from which a wedge of mistletoe tissue (a “haustorium”) penetrates the host branch, beginning the “infection.” This wedge of mistletoe tissue grows and ramifies inside the bark of the host branch, then puts down “sinkers” into successive layers of host xylem. Ultimately a complex ramifying system of haustorial strands is produced that consists of strands external and parallel to the host cambium, as well as a system of sinkers which are oriented radially into the xylem and phloem of the host. Frequently xylem to xylem connections develop between the host tree’s tracheids and the mistletoe’s haustoria vessels. Aerial shoot formation takes place about 2-5 years following infection, and male or female flower formation occurs about 1 to 5 years following aerial shoot formation. Fruits may take several months to mature. Male shoots die after flowering, females die after releasing their mature seeds. When the shoots die and drop off the infected branch, they leave a distinctive basal “cup” on the host bark. Eventually the old infection sites deteriorate and usually become infected with decay fungi.

Prevention is the best control of dwarf mistletoe. One way to accomplish this is by adequately mixing tree species when initially planting a site, rather than planting a “mono-culture,” i.e. large concentrations of a single host species. When feasible, in areas in which a particular species of dwarf mistletoe is known to be a problem, include conifer species among the newly planted seedlings which are not hosts of that species of dwarf mistletoe. To eliminate or reduce the incidence of a dwarf mistletoe species on a given site, infected host trees are sometimes intentionally killed to prevent the mistletoe from completing its life cycle. This halts the production and dissemination of berries and seeds. The most economical means of inoculum reduction is to simply remove infected trees when an area is logged or thinned.

REFERENCES


LEAFY MISTLETOES
Phoradendron spp.
Viscum album

California is home to several species of the leafy mistletoe genus Phoradendron, as well as the European leafy mistletoe, Viscum album. Some species of Phoradendron (which means “tree-thief”) attack many tree species, and some are only known to attack hosts within a single genus. Phoradendron is known only in the Western Hemisphere, with the area of greatest diversity in the tropics. Seven species commonly occur in California, parasitizing both broadleaf trees and some conifers. Viscum album, the common leafy mistletoe of Europe, was intentionally introduced into California by horticulturist Luther Burbank about 1900. After 75 years of establishment in the state, it had spread from its original site to about a 16 square mile area, the major concentration of the infected trees occurring within about a mile of the original site of Burbank’s experimental farm. Burbank originally had inoculated apple trees using seeds, and 75 years later the parasite was found on twenty additional California hosts.

Leafy mistletoes are “hemi-parasites,” i.e. they are dependent on their hosts primarily for water and minerals, but manufacture their own food via photosynthesis using the chlorophyll in their green leaves. However, even in the absence of the green aerial portions of the mistletoe plant, the parasite can live in a host branch for many years. Trees heavily parasitized by leafy mistletoes are weakened, reduced in growth rate, and disfigured, but seldom are killed by the mistletoe alone. The most significant damage is probably done by predisposing weakened trees to damage from other pests or from adverse conditions such as drought stress. The parasite stimulates the growth of abnormal and excessive branching (“brooming”) and causes branch swellings which eventually become sites for decay organisms. In addition to simply reducing timber quality, weakened branches are prone to damage from wind breakage. Besides being forest pests, leafy mistletoes also have the potential to become significant agricultural pests in orchards.

Leafy mistletoes are primarily spread by birds which feed on the berries, then excrete the seeds while perched in a host tree. The seeds have a sticky coating which helps them stick to branches on which they fall. The mistletoe seed germinates on a tree branch, forms an attachment disc on the bark, then a haustorial strand grows from the disc into the branch through a lenticel or axillary bud. The haustorial strand enlarges and branches to form the parasitic haustorial system that includes radial “sinkers” which invade the host tree’s phloem tissue. The sinkers invade the rays and advance radially with the host cambium each year, and the haustoria also extend parallel to the branch. Once the mistletoe has a well-established haustorial “root system” in the host branch, aerial shoots of the mistletoe develop. Several years are necessary after the initial infection to produce a seed-bearing mistletoe plant. Mistletoe tends to be a more serious problem in larger, older trees than in smaller trees, possibly due to a preference on the part of birds for larger or taller trees. If birds spend a lot of time feeding on mistletoe berries in a particular tree, the mistletoe plant population can increase dramatically in that tree.

Several approaches can be taken to control leafy mistletoe. Pruning the host branch well below the point of mistletoe attachment will insure removal of the entire haustorial system from which another mistletoe plant could regrow. In addition, arborists continue to explore the efficacy of tree wraps, herbicides, and tree paints to control leafy mistletoe. And while it is true that merely removing the aerial shoots from an infected branch will not eradicate the mistletoe plant, since the parasite may still continue to slowly grow within the host, it is not an entirely fruitless measure. Removal of mistletoe shoots every couple of years at least reduces the amount of mistletoe seed inoculum for that tree and neighboring trees; it reduces some of the parasitic “drain” on the host branch; and because of the lack of berries, it reduces the attractiveness of the tree to birds. For seriously infested sites, one should consider the removal of heavily infected trees, and replacement with tree species which are not hosts to the particular mistletoe species present.

REFERENCES
DODDER

*Cuscuta* spp.

Dodder (*Cuscuta* spp.) is a parasitic plant with tough, curling, leafless, string-like stems which twine around its host plant. There are many descriptive common names for dodder, such as “strangleweed,” “goldthread,” “pull-down,” “devil’s hair,” and “hellbind,” just to name a few. From a distance dodder plants look like masses of yellow to orange string tangled in a plant. Worldwide, there are at least 170 species of dodder, most of which occur in North and South America, although dodder species are reported on all seven continents. Damage from dodder comes both in the physical damage it does to its host—stunting and weakening of the host plants, reduced stand density, poor flower and seed set, or even mortality—as well as the economic damage from the rejection of seed lots for export due to dodder contamination. Clover seed production in Europe came to a complete halt early in the twentieth century due to problems brought on by dodder. Here in California, 86% of San Joaquin County’s 1951 seed lots owned for export certification were rejected that year because of dodder contamination.

Some species of dodder show a preference for a very narrow range of hosts. Other species can parasitize a wide range of plants. There are documented instances of land being cleared for agricultural use which had formerly been wooded or populated by native vegetation infested with dodder, only to result in massive dodder epidemics in the new agricultural crop. Most dodder species commonly found attacking weeds along the sides of roads are usually harmless to nearby agricultural crops. Nonetheless, it is a good idea to have such species identified to be certain. Some of the most important economic crops in California that are parasitized by dodder are alfalfa and clover, as well as sugar beets, tomatoes, onions and asparagus. Fortunately, certain plants are less susceptible to parasitism by dodder, such as small grains. One species of dodder, *Cuscuta pentagona*, has been successfully grown as an autotroph on sterile agar medium.

After the dodder seed germinates, the seedling forms a small leafless stem that twines around until it strikes a host plant. Some dodders will grab onto any host temporarily until they can locate a preferred host. Once the dodder stem locates a susceptible host, it tightly encircles the stem of the host plant and sinks peg-like “haustoria” into the host stem that act like “roots,” parasitizing the host’s food and water supply. Not uncommonly, hypertrophy (swellings) develop at the point of haustorial attachment. By this time the rudimentary root of the dodder plant withers and dies, severing all contact with the ground, and the parasite lives entirely at the expense of the host to which it has become attached. From there, the dodder plant continues to grow and contact surrounding plants as well. Documented cases of a single dodder seedling eventually covering 10 to 15 square feet are not uncommon. If a germinated dodder seedling fails to contact a susceptible host within about a month, it simply dies. When a host plant dies, so does the dodder, but usually not until it has managed to flower, fruit, and drop seed on the soil. Amazingly, some dodder plants do not even require a living host on which to complete their life cycle, i.e. to bring their seeds to maturity. If the dodder is just past its flowering stage when
the host crop is cut, it can finish the maturation process of its seeds even on the cut hay! In addition, dodder seed which has only achieved "half-maturity" can still germinate as readily as fully matured seed! A single dodder plant is capable of producing up to 3,000 seed. If the crop plants can be cut before the dodder's flowering stage, there is much less chance of the dodder producing viable seed.

There are a number of ways to spread dodder. Contamination of seed lots is probably the most common means, particularly in the cases of clover and alfalfa seeds which look similar and weigh the same as dodder seed. But dodder can also be moved as stem fragments as well as seed in infested hay, contaminated farm machinery and implements, irrigation water, grazing animals, and in animal manures which have not been adequately composted. In temperate areas, as well as in some colder climates, the dodder plants can also over-winter on as short pieces of dodder stems attached to perennial hosts. Even the internal haustorial tissue can successfully over-winter in dodder-induced galls of host tissue.

The hard dodder seeds can remain dormant in soil for many years. Records of seed viability lasting ten years under field conditions are documented. Only a small percentage of the seeds germinate in any one year. Consequently, once a field is infested with dodder seed, it will be present for many years to come. Some dodder seeds have been observed to germinate at soil depths of up to ten centimeters; more commonly, in the case of the common alfalfa "field dodder" (Cuscuta pentagona) for example, the majority of the seeds germinate and emerge from soil depths of about three centimeters or less.

Some dodders contain small amounts of chlorophyll. Consequently, some photosynthesis may occur during the seedling stage, but even this rapidly diminishes as the plants become more parasitic, extracting their food, inorganic salts and water from their hosts.

The most effective control against dodder is, of course, preventing its introduction, particularly via contaminated seed. Seed processors go to great efforts to cleanse alfalfa seed lots of dodder seed using various methods. In addition, constant survey should be made for dodder patches so that they can be eliminated early, preferably before the flowering stage. Spot killing of the dodder plants along with their hosts or burning is one approach. Mowing down host plants before the dodder has a chance to flower, and rotating with non-host crops are other, although more temporary, solutions. It is important to promptly detect and prevent "bridging" of dodder plants from one row of a host crop to adjacent rows in commercial fields planted to a single crop. Controlling weeds that also serve as hosts of the same dodder is important for the same reason. Of course, in the case of infected woody perennials, one can simply prune out the infected branches and destroy them along with the dodder. And lastly, although no "ideal" material is available yet, both chemical and biological controls for dodder are currently under investigation.

REFERENCES

The broomrapes are annual flowering plants that parasitize the roots of other plants. The role of broomrapes as parasites has been recognized since the second century BC. Broomrapes lack roots of their own, as well as chlorophyll. Consequently, water and food are taken from a host plant by way of attachment to the host’s root system. Broomrapes are erect, yellowish plants with scaly or hairy stems and fleshy underground parts. Flowers of broomrape plants occur in spikes on the upper part of the plant. Where native, the morphology of broomrapes is highly variable. This variability is much less pronounced where the broomrape has been introduced. Unquestionably, the most notorious genus of root parasites in California is Orobanche, the true broomrapes. Even the meaning of the Greek name “Orobanche” is ominous sounding—“vetch strangler.” Orobanche is a very large genus that includes several California natives. In California, broomrapes affect a wide variety of native and introduced host plants, including many ornamentals and a number of significant agricultural crops such as lettuce, tomatoes, various legumes and crucifers.

One of the most striking features of broomrapes is their tremendous seed production, which is the secret of their amazing spread and survival. One Orobanche ramosa plant, e.g., may produce as many as fifty thousand of the tiny seeds that germinate only in the presence of the roots of a susceptible host plant. They can lie dormant in a field for more than a decade where they wait to come in contact with roots of a susceptible host. Meanwhile, the seeds are easily carried throughout a field, or from field to field, via irrigation water or farm equipment. Since numerous broomrape plants may be attached to the roots of a single host, the capacity for seed production is astronomical. In the 1960's, California's tomato growing area experienced an epidemic of branched broomrape, Orobanche ramosa. Reports of as many as fifty broomrape plants on a single tomato plant were not uncommon. Thus, literally millions of the tiny, long-lasting broomrape seeds could be produced from a single infected tomato plant.

It is believed that branched broomrape, Orobanche ramosa, was accidently introduced into North America from China in the late 1800's with hemp seed (Cannabis sativa), that was being grown as a fiber crop at the time. In 1929 branched broomrape was found in a California tomato field in Alameda County. From there it spread to several thousand acres, presumably via flooding, irrigation, and farm equipment. In 1959-1960 two more infestations of branched broomrape were found in California's San Joaquin Delta area, that were well established by the time they were discovered. Probably not by coincidence, early CDFA records indicate that at least one farmer was attempting to grow hemp commercially in the Delta in the early 1900's.

The branched broomrape outbreak of the 1960's resulted in widespread stunting of tomato plants and serious tomato yield reductions. Numerous scientific studies were conducted that dealt with life cycles, host ranges, and control strategies. Fumigation was carried out in some fields. Surveys conducted at the time revealed that the introduced pathogen had a host range of at least forty different hosts in California. More recently (1984), K.R. Langdon of the Florida Department of Agriculture and Consumer Services compiled a list of over sixty hosts of branched broomrape. Since tomatoes were one of the most important vegetable crops in California, a "branched broomrape eradication project" that involved the University of California, USDA, and the California Department of Food and Agriculture was undertaken to eradicate this pest. The project was carried on for several years, but ultimately was abandoned in the late 1970's due to lack of funding. Currently, because of careful cultural practices as well as changes in crop selection, branched broomrape is neither widespread nor a particularly serious problem in California agriculture.

Actually, California has experienced not one, but two "broomrape scares" this century. In the late 1950's "Cooper's broomrape," Orobanche cooperi, a native of the Southern California desert, was discovered to be infecting tomato transplants in the Coachella Valley. These transplants were being grown for planting commercial tomato fields in various locations throughout the state. The panic quickly subsided, however, when it was found through careful field experimentation that this broomrape was relatively limited in its range to California's hot desert areas, and was unable to effectively germinate, infect, grow, and reproduce in the cooler, commercial tomato growing areas of the state.

Economic control of broomrapes consists primarily of spot treatment of infected plants (rouging infected plants), prevention (using clean, pathogen-free crop seed), cultural techniques (deep plowing, rotation), and through regulatory action such as quarantines, harvesting restrictions, detection survey, and seed certification. Fumigation has been shown to be effective, but is an expensive option. Some biocontrols (using pathogens and insects to control the parasite) have shown promise, but need further study and development.

In addition to Orobanche, several other genera of plants in California, including some with chlorophyll,
are considered root parasites of other plants. For example, in the plant family Scrophulariaceae, the genera
Castilleja, Pedicularis, and (some) Orthocarpus, although green, are considered to be at least partially parasitic on
roots of other plants. The genera Pilostyles, Pholisma, Ammobroma, and Boschniakia, like Orobanche, are examples
of other California plants without chlorophyll that live exclusively as parasites on the roots of other plants.

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TRIFOLIUM SP.
TRIFOLIUM PRATENSE L. (CONTAMINATED SEED LOT)
ZEA MAYS L.

CUSCUTA AMERICANA L.
BETA VULGARIS L.
CITRUS SP.
NICOTIANA SP.

CUSCUTA APPROXIMATA BAB.

HEDERA HELIX L.
HYPERICUM CALYCINUM L.
LABURNUM ANAGYROIDES MEDIK.
MEDICAGO SATIVA L.
PHASEOLUS VULGARIS L.
PISUM SATIVUM L.
TRIFOLIUM SP.
Vicia FABA L.
VIGNA UNGUICULATA (L.) WALP.

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Vicia FABA L.
VIGNA UNGUICULATA (L.) WALP.

CUSCUTA APPROXIMATA BAB. VAR. URCEOLATA (KUNZE) YUNCKER
SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA ARVENSI BEYR. EX HOOK.
SEE: CUSCUTA PENTAGONA ENGELM.

CUSCUTA BRACHYCALYX (YUNCK.) VAR. APODANTHERA YUNCKER
SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA BRACHYCALYX (YUNCK.) YUNCKER
SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA CALIFORNICA HOOK. & ARN.
ABRONIA UMBELLATA LAM.
ACMISPON SP.
ADENOSTOMA FASCICULATUM H. & A.
CUSCUTA CALIFORNICA HOOK. & ARN. - continued

- ALLIUM CEPA L.
- AMBROSIA SP.
- ARTEMISIA ROTHROCKII GRAY
- ASCLEPIAS FASCICULARIS DECNE. IN A.DC.
- ASTER SP.
- ATAENIA SP.
- ATRIPLEX PHYLLOSTEGIA (Torr.) WATS.
- BETA VULGARIS L.
- CALYPTRIDIUM UMBELLATUM (Torr.) GREENE
- CHAMAEBATIA FOLIOSA BENTH.
- CHRYSOTHAMNUS NAUSEOSUS (Pall. ex Pursh) BRITTON
- CLEOMELLA SP.
- CLEOMELLA PLOCASPERMA WATS.
- CORETHROGYNE SP.
- CROTON CALIFORNICUS MUELL.-ARG.
- CUSCUTA AMERICANA L. (HYPERPARASITISM)
- CUSCUTA CALIFORNICA HOOK. & ARN. (AUTOPARASITISM)
- CUSCUTA CAMPESTRIS YUNCK. (HYPERPARASITISM)
- CUSCUTA SUBINCLUSA DUR. & HILG. (HYPERPARASITISM)
- DUDLEYA VISCIDA (WATS.) MORAN
- ENCELIA VIRGINENSIS A. NELS.
- ERIODICTYON CALIFORNICUM (H. & A.) TORR.
- ERIOGONUM SP.
- ERIOGONUM FASCICULATUM BENTH.
- ERIOGONUM FASCICULATUM SSP. FOLIOSUM (NUTT.) S. STOKES
- ERIOGONUM KENNEDYI PORTER IN WATS.
- ERIOGONUM UMABELLATUM TORR.
- ERIOGONUM WRIGHTII TORR. EX BENTH.
- GILLIA AGGREGATA (PURSH) SPRENG.
- HAPLOPAPPUS PINIFOLIUS GRAY
- HEDERA SP.
- HEMIZONIA CLEVELANDI GREENE
- HOLOCARPHA SP.
- HOLOZONIA FILIPES (H. & A.) GREENE
- LESSINGIA SP.
- LOTUS SP.
- LOTUS PURSHIANUS (BENTH.) CLEM. & CLEM.
- LUPINUS SP.
- LUPINUS CHAMISSONIS ESCHS.
CUCUTA CALIFORNICA HOOK. & ARN. - continued
LYCOPERSICON ESCULENTUM MILL.
MESEMBRYANTHEMUM CRISTALLINUM L.
MONARDELLA SP.
MONARDELLA ODORATISSIMA BENTH.
MONARDELLA VILLOSA BENTH.
NICOTIANA SP.
PENSTEMON SP.
PENSTEMON NEWBERRYI GRAY SSP. BERRYI (EASTW.) KECK
PHYTOLACCA AMERICANA L.
SALVIA SP.
SALVIA APIANA JEPSON
SAMOLUS PARVIFLORUS RAF.
SCIRPUS SP.
SOLIDAGO SP.
STEPHANOHERMIA SP.
TRICHOSTEMA LAXUM GRAY
VICIA AMERICANA MUHL. EX WILLD.

CUCUTA CALIFORNICA HOOK. & ARN. VAR. APODANTHERA YUNCKER
SEE: CUCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUCUTA CALIFORNICA HOOK. & ARN. VAR. BRACHICALX YUNCKER
SEE: CUCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM
ACHILLEA SP.
ACHILLEA LANULOSA NUTT.
ASTER SP.
ASTER OCCIDENTALIS (NUTT.) T. & G.
ATRIPLEX SP.
CALYTRIDIOUM SP.
CALYTRIDIOUM UMBELLAT M (Torr.) GREENE
CEANOTHUS CORDULATUS KELL.
CHRYSOCHRAMUS NAUSEOSUS (PALL. EX PURSH) BRITTON
COMPOSITAE
DISTICHIS SP.
ERIOGONUM SP.
ERIOGONUM NUDUM (DOUGL. EX BENTH.) S. STOKES
ERIOGONUM UMBELLATUM TORR.
CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM. - continued

GRAMINAE
GRINDELIA SP.
HEMIZONIA CLEVELANDI GREENE
HEMIZONIA PUNGENS (H. & A.) T. & G.
HEMIZONIA RUSIS GREENE
MONARDELLA SP.
MONARDELLA ODORATISSIMA BENTH.
MONARDELLA VILLOSA BENTH. VAR. SHELTONII (TORR.) EPLING
ORTHOCARPUS COPELANDII EASTW.
SALVIA MELLIFERA GREENE
SOLANUM SP.
TRIFOLIUM SP.
WISLIZENIA REFRACTA ENGELM.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. GRACIFOLIA ENGELM.
SEE: CUSCUTA CALIFORNICA H. & A.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. LONGILOBA ENGELM.
SEE: CUSCUTA CALIFORNICA H. & A.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. PAPILLOSA YUNCKE
ERIODICTYON TRICHOCALYX HELLER.
ERIOGONUM FASCICULATUM BENTH.
HYMENOCLEA SALSOLA T. & G.
PAROSELA SPINOSA HEL.

CUSCUTA CALIFORNICA HOOK. & ARN. VAR. SQUAMIGERA ENGELM.
SEE: CUSCUTA SALINA ENGELM.

CUSCUTA CAMPESTRIS YUNCKER
SEE: CUSCUTA PENTAGONA ENGELM.

CUSCUTA CEANOTHI BEHR.
SEE: CUSCUTA SUBINCLUSA DUR. & HILG.

CUSCUTA DECIPIENS YUNCKER
DYSSODIA PENTACHAETA (DC.) ROBINSON
STROTHERIA GYP SOPHILA B. TURNER
CUSCUTA DECORA ENGELM.
SEE: CUSCUTA INDECORA CHOISY

CUSCUTA DENTICULATA ENGELM.
ATRIPLEX SP.
CHRYSO THAMNUS PANICULATUS (GRAY) HALL.
COLEOGYNE RAMOSSI SIMA TORR.
COVIL LEA SP.
HAPLOAPPUS SP.
HYMENOCLEA SP.
HYMENOCLEA ALSOL A T. & G.
LARREA SP.
LEPIDOSPARTUM SQUAMATUM (GRAY) GRAY

CUSCUTA EPITHY MUM M URR.
SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA GLANDULO S A SMALL.
SEE: CUSCUTA OBTUSIFLOR A HBK. VAR. GLANDULO S A ENGELM.

CUSCUTA HOWELLI A NA RUBTZOFF
ERYNGIUM ALIS MI FOLIUM GREENE

CUSCUTA INDECORA CHOISY
AMBROSIA SP.
AMBROSIA PSILOSTACHY A DC.
ARTEMISIA SP.
ASCLEPIAS SP.
ASTER SP.
ASTER ANDERSONII GRAY
CEANOTHUS CORDULATUS KELL.
CENTAUREA MELITEN SI S L.
CENTROMADIA PUNGENS (T. & G.) GREENE
CHENOPODIUM SP.
JUNCUS NEVADEN SI S WATS.
LOTUS SP.
LOTUS PURSHIANUS (BENTH.) CLEM. & CLEM.
LYCOPERSICON ESCULENTUM MILL.
MEDICAGO SATV A L.
NAMA SP.

UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
MUNZ & KECK, 1973
MUNZ & KECK, 1973
MUNZ & KECK, 1973
MUNZ & KECK, 1973
UCB HERBARIUM
UCR HERBARIUM
UCR HERBARIUM
UCR HERBARIUM
ASHTON & SANTANA, 1976
UCB HERBARIUM
UCR HERBARIUM
CDFA PLANT PATHOLOGY
ASHTON & SANTANA, 1976
UCB HERBARIUM
CUSCUTA INDECORA CHOISY - continued

OLEA EUROPaea L.
PLAGIOBOTRYS SP.
PORTERELLA CARNOSULA (H. & A.) TORR.
RHAMNUS SP.
SALSOLA SP.
SOLIDAGO CONFINIS GRAY

CUSCUTA INDECORA CHOISY VAR. INDECORA
CEANOTHUS DIVERSIFOLiUS KELL.
TRIFOLIUM SP.

CUSCUTA INDECORA CHOISY VAR. NEUROPETALA (ENGELM.) HITCH.
AMBROSIA SP.
ARTEMISIA SP.
ASCLEPIAS SP.
ASTER SP.
MEDICAGO SATIVA L.

CUSCUTA JEPSONII YUNCK.
SEE: CUSCUTA INDECORA CHOISY VAR. INDECORA

CUSCUTA NEVADENSIS JTN.
ATRIPLEX SP.
ATRIPLEX CONFERTIFOLiA (TORR. & FREM.) WATS.
SUAEDEA TORREYANA WATS.

CUSCUTA OBTUSIFLORA HBK. VAR. GLANDULOSA ENGELM.
POLYGONUM SP.

CUSCUTA OCCIDENTALIS MILLSPAUGH
SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIIFLORA ENGELM.

CUSCUTA PENTAGONA ENGELM.
ALLIUM SP.
AMBROSIA SP.
AMBROSIA CHAMISSONIS (LESS.) E. GREENE
ASPARAGUS OFFICINALIS L.
ASTERACEAE
AVENA SP.

CDFA BULLETIN (1936) 25:213-215
UCB HERBARIUM
UCB HERBARIUM
UCB HERBARIUM
ASHTON & SANTANA, 1976
UCR HERBARIUM

UCB HERBARIUM
HANSEN, 1923

MUNZ & KECK, 1973
MUNZ & KECK, 1973
MUNZ & KECK, 1973
MUNZ & KECK, 1973

MUNZ, 1974
UCB HERBARIUM
UCR HERBARIUM

MUNZ & KECK, 1973

ASHTON & SANTANA, 1976
UCR HERBARIUM
UCR HERBARIUM
ASHTON & SANTANA, 1976
MUNZ, 1974
UCR HERBARIUM
CUSCUTA PENTAGONA ENGELM. - continued
    BACCHARIS GLUTINOSA PERS.
    BETAR VULGARIS L.
    CARTHAMUS TINCTORIUS L.
    CHENOPODIUM SP.
    CHENOPODIUM ALBUM L.
    CONVOLVULUS SP.
    CONVOLVULUS ARvensis L.
    CUCUMIS MELO L. VAR. HONEYDEW
    CUCURBITACEAE
    DICbONDRA MICRANTHA URII.
    FRANSERIA BIPPINNATIFIDA KITI.
    FEDERA HELIX L.
    HELIANTHUS SP.
    HELIANTHUS ANNUUS L.
    LOTUS PURSHIANUS (BETH.) C.I.M. & C.IM. VAR. GLABER (NUTT.) MUNZ
    LUCOPERSICON ESCULENTUM MILL.
    MALVA SP.
    MALVA PARVIFLORA L.
    MEDICAGO SATIVA L.
    MYRiOPHYLLUM SIBIRICUM VAR. EXALBESCENS JEPS.
    PHYTOLACCA AMERICANA L.
    POLYGONUM SP.
    POLYGONUM AVICULARE L.
    SENECIO HYDROPHILUS NUTT.
    SIDA HEDERACEA (DOUG.) TORR.
    TRIFOLIUM SP.
    TRIFOLIUM REPENS L.
    VICIA SATIVA L. SUBSP. SATIVA
    XANTHIUM SP.
    XANTHIUM STRUMARIUM L. VAR. CANADENSe (MILL.) T. & G.

CUSCUTA PENTAGONA VAR. CALYcINA ENGELM.
SEE: CUSCUTA PENTAGONA ENGELM.

CUSCUTA PLANIFLORA MUNZ
SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA PULCHERRIMA SCHEELE.
SEE: CUSCUTA INDECORA CHOISY
CUSCUTA RACEMOSA VAR. CHILIANA ENGELM.
   SEE: CUSCUTA INDECORA CHOISY VAR. INDECORA

CUSCUTA SALINA APODA YUNCK.
   SEE: CUSCUTA NEVADENSIS JTN.

CUSCUTA SALINA ENGELM.
   ALLENROLF EA OCCIDENTALIS (S. WATS.) KUNTZE
   ATRIPLEX CONFERTIFOLIA. (TORR. & FREM.) WATS
   CHENOPODIUM SP.
   CRESSA SP.
   FRANKENIA SP.
   FRANKENIA GRANDIFOLIA CHAM. & SCHECT. VAR. CAMPESTRIS GRAY
   HAPLOPAPPUS SP.
   JAUMAEA CARNOSA (LESS.) GRAY
   SALICORNIA VIRGINICA L.
   SUAEDA SP.

CUSCUTA SALINA ENGELM. VAR. MAJOR YUNCKER
   BASSIA SP.
   FRANKENIA GRANDIFOLIA CHAM. & SCHECT.
   HEMIZONIA PARRYI GREENE
   SALICORNIA SP.
   SALICORNIA VIRGINICA L.

CUSCUTA SALINA ENGELM. VAR. SQUAMIGERA YUNCK.
   SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SQUAMIGERA PIPER
   SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SQUAMIGERA PIPER VAR. SQUAMIGERA YUNCK.
   SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SUAVEOLENS SER.
   SEE: CUSCUTA INDECORA CHOISY VAR. INDECORA

CUSCUTA SUBINCLUSA DUR. & HILG.
   ABelia GRANDIFLORA REHD.
   ACER MACROPHYLLUM PURSH
   ACHILLEA MILLEFOLIUM L.

UCB HERBARIUM
UCB HERBARIUM
MUNZ, 1974
UCB HERBARIUM
UCB HERBARIUM
UCR HERBARIUM
UCB HERBARIUM
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UCB HERBARIUM
ASHTON & SANTANA, 1976
UCB HERBARIUM
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UCB HERBARIUM
CDEA PLANT PATHOLOGY
UCB HERBARIUM
UCB HERBARIUM
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<th>Scientific Name</th>
<th>Herbarium</th>
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<tr>
<td>Cuscuta subinclusa Dur. &amp; Hilg. - continued</td>
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<td>Cuscuta subinclusa Dur. &amp; Hilg. (Autoparasitism)</td>
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<tr>
<td>Aesculus sp.</td>
<td>UCB herbarium</td>
<td>Ashton &amp; Santana (1976)</td>
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<tr>
<td>Aesculus californica (Spach.) Nutt.</td>
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<tr>
<td>Aconitum sp.</td>
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<tr>
<td>Arbutus menziesii Pursh</td>
<td>UCB herbarium</td>
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<tr>
<td>Arctostaphylos glandulosa EASTW.</td>
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<td>Artemisia douglasiana Besser ex Hook.</td>
<td>UCB herbarium</td>
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<td>Artemisia dracunculus L.</td>
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<td>Artemisia vulgaris L.</td>
<td>UCB herbarium</td>
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<td>Baccharis sp.</td>
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<td>Baccharis pilularis DC.</td>
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<td>Baccharis viminea DC.</td>
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<td>Beta vulgaris L.</td>
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<td>Ceanothus sp.</td>
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<td>Ceanothus cordulatus Kell.</td>
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<td>Ceanothus integrerrimus H. &amp; A.</td>
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<td>Ceanothus sorediatus H. &amp; A.</td>
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<td>Cercocarpus betuloides Nutt. ex T. &amp; G.</td>
<td>UCB herbarium</td>
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<td>Chamaebatia foliosa Bentham</td>
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<td>Chrysanthemum nauseosus (Fall. ex Pursh) Britton</td>
<td>UCB herbarium</td>
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<td>Citrus sp.</td>
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<td>Citrus aurantifolia Swing</td>
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<td>Citrus excelsa Wester</td>
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<td>Citrus Jambeiri Lush</td>
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<td>Citrus limon (L.) Burm.</td>
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<tr>
<td>Citrus limon (L.) Burm. cv. Lisbon</td>
<td>UCB herbarium</td>
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<td>Citrus medica L. var. etrog</td>
<td>UCB herbarium</td>
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<td>Citrus sinensis (L.) Osbeck cv. Valencia</td>
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<td>Clematis sp.</td>
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<td>Convolvulus sp.</td>
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<td>Cuscuta californica Hook. &amp; Arn. (Hyperparasitism)</td>
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<td>Cuscuta subinclusa Dur. &amp; Hilg. (Autoparasitism)</td>
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<td>Datisca glomerata (Pres.) Bail.</td>
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<td>Eriogonium sp.</td>
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<td>Grindelia humulis H. &amp; A.</td>
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<td>Heteromeles arbutifolia M. Roem.</td>
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<td>Lactuca Serriola L.</td>
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<td>Lathyrus sp.</td>
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<td>Linanthus nuttallii (S.F. Gray) Greene</td>
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<td>Lupinus sp.</td>
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CUSCUTA SUBINCLUSA DUR. & HILG. - continued
MONARDELLA VILLOSA BENTH.
NICOTIANA SP.
PETUNIA HYBRIDA VILM.
PLUCHEA SERICEA (NUTT.) COV.
PONCIRUS TRIFOLIATA (L.) RAF. X CITRUS SINENSIS (L.) OSBECK
PRUNUS SP.
PRUNUS ILICIFOLIA (NUTT.) WALP.
PRUNUS VIRGINIANA L. VAR. DEMISSA NUTT.) TORR.
PSORALEA PHYSODES DOUGL. EX HOOK.
QUERCUS SP.
QUERCUS KELLOGGII NEWB.
QUERCUS WISLizenii A. DC.
RHODODENDRON OCCIDENTALE (TORR. & A. GRAY) A. GRAY
RHUS SP.
RHUS DIVERSILOBA TORR. & A. GRAY
RHUS LAURINA NUTT.
RHUS OVATA WATS.
ROSA SP.
ROSA CALIFORNICA CHAM. & SCHLECTEND
SALIX SP.
SALIX BREWERI BEBB
SALIX GOODDINGII BALL.
SALIX HINSIANA BENTH.
SALIX LasiOLEPIS BENTH.
SALVIA SONOMENSIS GREENE
SAMBUCUS SP.
SAMBUCUS CAERULEA RAF.
SCHINUS MOLLE L.
SYMPHORICARPOS ALBUS (L.) S.F. BLAKE
UMBELLULARIA CALIFORNICA (H. & A.) NUTT.
VIGNA UNGUICULATA (L.) WALP.
VINCA MINOR L.

CUSCUTA SUBINCLUSA DUR. & HILG. VAK. ABBREVIATA ENGELM.
SEE: CUSCUTA SALINA ENGELM.

CUSCUTA SUKSDORFII YUNCK.
SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.
CUSCUTA SUKSDORFII YUNCK. VAR. SUBPEDICELLATA YUNCK.
    SEE: CUSCUTA CALIFORNICA HOOK. & ARN. VAR. BREVIFLORA ENGELM.

CUSCUTA TRIFOLII BAB.
    SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA URCEOLATA KUNZE.
    SEE: CUSCUTA APPROXIMATA BAB.

CUSCUTA VEATCHII APODA YUNCK.
    SEE: CUSCUTA NEVADENSIS JTIN.

CUSCUTA VEATCHII BRANDEGEE
    SEE: CUSCUTA DENTICULATA ENGELM.

KOPSIOPSIS STROBILACEA GRAY
    SEE: BOSCHNIAKIA STOBILACEA GRAY

KOPSIOPSIS TUBEROSA G. BECK
    SEE: BOSCHNIAKIA HOOKERI WALP.

MYCORRHIZA CALIFORNICA (CHAM. & SCHL DL.) RYDB.
    SEE: OROBANCHE CALIFORNICA CHAM. & SCHL DL.

MYCORRHIZA CORYMBOSA RYDB.
    SEE: OROBANCHE CORYMBOSA (RYDB.) FERRIS

MYCORRHIZA GRAYANA G. BECK
    SEE: OROBANCHE CALIFORNICA CHAM. & SCHL DL. SSP. GRAYANA (BECK) HECK.

MYCORRHIZA VIOLACEA (EASTW.) JEPSON
    SEE: OROBANCHE CALIFORNICA CHAM. & SCHL DL. SSP. CALIFORNICA

OROBANCHE SP.
    ARTEMISIA DRACUNCULUS L.
    ARTEMISIA TRIDENTATA NUTT.
    ERIODICTYON CRASSIFOLIUM BENTH.

OROBANCHE BULBOSA (GRAY) BECK.
    ADENOSTOMA FASCICULATUM H. & A.
    ARCTOSTAPHYLOS GLAUCA LINDL.

UCR HERBARIUM

UCR HERBARIUM

UCR HERBARIUM

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UCR HERBARIUM
OROBANCHE CALIFORNICA CHAM. & SCHLWL.
  ARTEMISIA TRIDENTATA NUTT.
  ASTER SP.
  COMPOSITAE
  ERIGERON SP.
  ERIOGONUM SP.
  ERIOPHYLLUM STAECHELIFOLIUM VAR. ARTEMISIAEFOLIUM
  GRAMINEAE
  HAPLOPAPPUS LINEARIFOLIUS DC.

OROBANCHE CALIFORNICA CHAM. & SCHLWL. SSP. CALIFORNICA
  FRAGARIA SP.
  GRINDELIA STRICTA DC. SSP. VENULOSA (JEPSON) KECK
  HETEROTHECA GRANDIFLORA NUTT.

OROBANCHE CALIFORNICA CHAM. & SCHLWL. SSP. CONDENA HECK.
  CHRYSOPSIS VILLOSIS (PURSH) NUTT.

OROBANCHE CALIFORNICA CHAM. & SCHLWL. SSP. FEUDGEI (MUNZ) HECK
  ARTEMISIA TRIDENTATA NUTT.
  ERIODICTYON SP.
  ERIOGONUM SP.

OROBANCHE CALIFORNICA CHAM. & SCHLWL. SSP. GRANDES HECKARD
  ADENOSTOMA SP.
  ADENOSTOMA FASCICULATUM H. & A.
  ARTEMISIA SP.
  HAPLOPAPPUS VENETUS (HBK.) BLAKE VAR. VERNONOIDES (NUTT.) HALL.
  HETEROTHECA SP.

OROBANCHE CALIFORNICA CHAM. & SCHLWL. SSP. GRAYANA (G. BECK) HECKARD
  ASTER SP.
  ERIGERON SP.

OROBANCHE CALIFORNICA CHAM. & SCHLWL. SSP. JEPSONII (MUNZ) HECKARD
  BACCHARIS VIMINEA DC.
  CHAENACTIS SP.
  CHRYSTHOMNUS SP.
  GRINDELIA SP.
  RUBUS VITIFOLIUS CHAM. & SCHLECHTEND

UCR HERBARIUM
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OROBANCHE CALIFORNICA CHAM. & SCHL. VAR. CALIFORNICA MUNZ.
SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE CALIFORNICA CHAM. & SCHL. VAR. CLAREMONTENSIS MUNZ
SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE CALIFORNICA CHAM. & SCHL. VAR. CORYMBOSA (RYDB.) M
SEE: OROBANCHE CORYMBOSA (RYDB.) FERRIS

OROBANCHE CALIFORNICA CHAM. & SCHL. VAR. PARISHII JEPSON
SEE: OROBANCHE PARISHII (JEPSON) HECKARD SSP. PARISHII HECKARD

OROBANCHE COMOSA HOOK.
SEE: OROBANCHE CALIFORNICA CHAM. & SCHL. SSP. GRAYANA (BECK) HECKARD

OROBANCHE COMOSA HOOK. VAR. VALLICOLA JEPSON
SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE COMOSA VAR. VIOLACEA (EASTW.) JEPSON
SEE: OROBANCHE CALIFORNICA CHAM. & SCHL. SSP. CALIFORNICA

OROBANCHE COOPERI (GRAY) HELLER
ABRONIA SP.
ACHYRONYCHIA COOPERI T. & G.
AMBROSIA DUMOSA (A. GRAY) PAYNE
BAILEYA PLENIRADIATA HAYR. & GRAY
CAMISSONIA CLAVIFORMIS (TORR. & FREM.) RAVEN
COLDENIA PLICATA (TORR.) COVILLE
DALEA SCHOTTII TORR.
ENCELIA FARINOSA GRAY
HILARIA RIGIDA (THURB.) BENTH. EX SCRIBN.
HYMENOCLEA SP.
HYMENOCLEA SALSOLA T. & G.
LARREA SP.
LARREA MEXICANA MORIC.
LYCOPERSICON ESCULENTUM MILL.
MALVA SP.
OENOTHERA SP.
PALAFOSIA LINEARIS (CAV.) LAG.
PARKINSONIA ACULEATA L.

UCR HERBARIUM
PHYTOPATHOLOGY (1957) 47:518
OROBANCHE COOPERI (GRAY) HELLER - continued
   PARKINSONIA FLORIDA, (BENTH. EX A. GRAY) S. WATS
   PHACELIA CRENULATA TORR. EX S. WATS.
   SAMBUCUS CAERULEA RAF.
   UCR HERBARIUM
   UCR HERBARIUM
   CDFA PLANT PATHOLOGY

OROBANCHE CORYMBOSA (RYDB.) FERRIS
   ARTEMISIA TRIDENTATA NUTT.
   ARTEMISIA SP.
   MUNZ, 1974
   UCB HERBARIUM

OROBANCHE FASCICULATA NUTT.
   ACER MACROPHYLLUM PURSH
   ADENOSTOMA FASCICULATUM H. & A.
   ARCTOSTAPHYLOS SP.
   ARTEMISIA SP.
   ARTEMISIA ARBUSCULA NUTT.
   ARTEMISIA NOVA A. NELS.
   ARTEMISIA TRIDENTATA NUTT.
   ARTOSTAPHYLOS NEVADENSIS A. GRAY
   CERCOCARPUM SP.
   ERIODICTYON SP.
   ERIODICTYON CALIFORNICUM (H. & A.) TORR.
   ERIODICTYON CRASSIFOLIUM BENTH.
   ERIODICTYON TRICHOCALYX HELLER.
   ERIOGONUM SP.
   ERIOGONUM FASCICULATUM BENTH.
   ERIOGONUM INCANUM T. & G.
   ERIOGONUM NUDUM (DOUGL. EX BENTH.) S. STOKES
   ERIOGONUM UMBELLATUM TORR.
   ERIOGONUM WRIGHTII TORR. EX BENTH.
   ERIOPHYLLUM SP.
   GALIUM SP.
   GALIUM BOLANDERI GRAY
   GALIUM PORRIGENS VAR. TENUE DEMP.
   HAPLOPAPPUS LINEARI-FOLIUS DC.
   ISOMERIS ARBOREA NUTT. VAR. ARBOREA
   MONARDELLA SP.
   PETUNIA HYBRIDA VILM.
   PHACELIA SP.
   PINUS MONOPHYLLA TORR. & FREM.
   Rhus DIVERSILOBA TORR. & A. GRAY
   UCB HERBARIUM
   UCB HERBARIUM
   UCB HERBARIUM
   UCR HERBARIUM
   UCB HERBARIUM
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   UCB HERBARIUM
   UCB HERBARIUM
   UCB HERBARIUM
   UCB HERBARIUM
   EL ALISO (1978) 9:197-278
   UCR HERBARIUM
   UCB HERBARIUM
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   UCB HERBARIUM
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   UCB HERBARIUM
   UCB HERBARIUM
   UCB HERBARIUM
   JEPSON, 1925
   UCB HERBARIUM
   UCB HERBARIUM
   UCB HERBARIUM
OROBANCHE FASCICULATA NUTT. SSP. FRANCISCANA (ACHEY) COX
SEE: OROBANCHE FASCICULATA NUTT.

UCB HERBARIUM

OROBANCHE FASCICULATA NUTT. SSP. UNIFLOROIDES COX
GALIUM SP.
GALIUM AMBIGUUM WIGHT
GALIUM CALIFORNICUM H. & A.
GALIUM NUTTALLII GRAY
UCB HERBARIUM

OROBANCHE FASCICULATA NUTT. VAR. FRANCISCANA D.B. ACHEY
SEE: OROBANCHE FASCICULATA NUTT.

UCB HERBARIUM

OROBANCHE FASCICULATA NUTT. VAR. LUTEA (PARRY) ACHEY
SEE: OROBANCHE FASCICULATA NUTT.

OROBANCHE FASCICULATA NUTT. VAR. TYPICA ACHEY
ARTEMISIA TRIDENTATA NUTT.
UCB HERBARIUM

OROBANCHE GRAYANA G. BECK
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL.

OROBANCHE GRAYANA G. BECK VAR. FEUDGEI MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. FEUDGEI (MUNZ) HECKARD

OROBANCHE GRAYANA G. BECK VAR. GRAYANA
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (G. BECK) HECKARD

OROBANCHE GRAYANA G. BECK VAR. JEPSONII MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. JEPSONII (MUNZ) HECKARD

OROBANCHE GRAYANA G. BECK VAR. NELSONII MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. CALIFORNICA HECKARD

OROBANCHE GRAYANA G. BECK VAR. VALLICOLA JEPSON
SEE: OROBANCHE VALLICOLA (JEPSON) HECKARD

OROBANCHE GRAYANA G. BECK VAR. VIOLACEA (EASTW.) MUNZ
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. CALIFORNICA HECKARD

OROBANCHE LUDOVICIANA NUTT. VAR. COOPERI (A. GRAY) G. BECK
SEE: OROBANCHE COOPERI (A. GRAY) HELLER.
OROBANCHE LUDOVICIANA NUTT. VAR. LATILOBA MUNZ
SEE: OROBANCHE COOPERI (A. CRAY) HELLER

MUNZ & KECK, 1973

OROBANCHE LUDOVICIANA NUTT. VAR. VALIDA MUNZ
SEE: OROBANCHE VALIDA JEPSON

MUNZ, 1974

OROBANCHE MULTIFLORA NUTT. VAR. ARENOSA (SUZUS.) MUNZ
ARTEMISIA SP.

MUNZ, 1974

OROBANCHE PARISHII (JEPSON) HECKARD SSP. BRACHIYLOBA HECKARD
ATRIPLEX CALIFORNICA MOQ. IN DC.
ERIогONUM LATIFOLIUM SM.
HAPLOPAPPUS SP.
ISOCOMA MENZIESII (HOO, & ARN.) G. NESOM

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MADRONO (1973) 22:41-70
HICKMAN, 1993

OROBANCHE PARISHII (JEPSON) HECKARD SSP. PARISHII HECKARD
ADENOSTOMA SP.
ARCTOSTAPHYLOS SP.
CORETHROGYNE SP.
CORETHROGYNE FILAGINIFOLIA (H. & A.) NUTT.
ERIODICTYON SP.
HAPLOPAPPUS SP.
PLUCHEA SERICEA (NUTT.) COV.

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MADRONO (1973) 22:41-70
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MUNZ & KECK, 1973
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OROBANCHE PINORUM GEYER EX HOOK.
HOLODISCUS SPP.
HOLODISCUS DISCOLOR (PURSH) MAXIM.

HICKMAN, 1993
UCB HERBARIUM
MUNZ & KECK, 1973

OROBANCHE PORPHYRANTHA G. BECK
SEE: OROBANCHE UNIFLORA L.

MUNZ & KECK, 1973

OROBANCHE RAMOSA L.
AMARANTHUS SP.
AMARANTHUS RETROFLEXUS L.
CANNABIS SATIVA L.
CAPSella BURSA-PASTORIS (L.) MEDIC.
CARTHAMUS TINCTORIUS L.
CHRYSANTHEMUM MORIFOLIUM RAMAT.
CONIUM MACULATUM L.

MUNZ & KECK, 1973
PLANT DISEASE REPORTER (1953) 37:136-137
PLANT DISEASE REPORTER (1953) 37:136-137
USDA #165
CDFA PLANT PATHOLOGY
CDFA PLANT PATHOLOGY
PLANT DISEASE REPORTER (1953) 37:136-137
OROBANCHE RAMOSA L. - continued

LACTUCA SATIVA L.
LYCopersicon ESCULENTUM MILL.
MELILOTUS ALBA MEDIK.
MELILOTUS INDICA (L.) ALL.
POLYGONUM PERSICARIA L.
SAMBUCUS SP.
SOLANUM SARACHOIDES SENDT. EX MART.
XANTHIIUM SPINOSUM L.
XANTHIIUM STRUMARIUM L. VAR. CANADENSE (MILL.) T. & G.

OROBANCHE SEDI FERN.
SEE: OROBANCHE UNIFLORA L.

OROBANCHE TUBEROsa HELLER
SEE: OROBANCHE BULBOSA (GRAY) BECK.

OROBANCHE UNIFLORA L.
ADENOSTOMA SP.
COMPOSITAE
CRASSULACEAE
DODECATHEON SP.
GALIIUM ANDREWSII GRAY
LITHOHRAGMA SP.
LITHOHRAGMA AFFINE A. GRAY
LITHOHRAGMA PARVIFLORUM (HOOK.) NUTT. EX TORR. & A. GRAY
PENSTEMON SP.
SAXIFRAGA SP.
SAXIFRAGA CALIFORNICA GREENE
SAXIFRAGA FALAX GREENE
SAXIFRAGA OREGANA HOWELL
SAXIFRAGEAE
SEDUM SP.
SEDUM LAXUM (BRITTON) BERGER SSP. LATIFOLIUM CLAUSEN
SEDUM OBATUSATUM GRAY
SEDUM SPATHULIFOLIUM HOOKER
SELAGINELLA SP.

OROBANCHE UNIFLORA L. SSP. OCCIDENTALIS (E. GREENE) FERRIS
SEE: OROBANCHE UNIFLORA L.
OROBANCHE UNIFLORA L. VAR. MINUTA (SUkład.) ACHEY
SEE: OROBANCHE UNIFLORA L.

OROBANCHE UNIFLORA L. VAR. PURPUREA (HELLER) ACHEY
SEE: OROBANCHE UNIFLORA L.

OROBANCHE UNIFLORA L. VAR. SEDI (SUkład.) ACHEY
SEE: OROBANCHE UNIFLORA L.

OROBANCHE VALIDA JEPSON
ERIODICTYON SP.
GARRYA FREMONTII TORR.
QUERCUS CHRYSOLEPIS LIEBM.

OROBANCHE VALIDA JEPSON SSP. VALIDA
CHAPARRAL SHRUBS, VARIOUS

OROBANCHE VALIDA SSP. HOWELLII HECK. & COLLINS
ERIODICTYON TRICHOCALYX HELLER VAR. TRICHOCALYX
GARRYA VEOATII KELL.

OROBANCHE VALLICOLA (JEPSON) HECKARD
ARTEMISIA SP.
PYRUS COMMUNIS L.
QUERCUS SP.
QUERCUS AGRIFOLIA NEF.
SAMBUCUS SP.
SAMBUCUS CAERULEA RAE.
SYMPHORICARPUS ALBUS (L.) BLAKE VAR. LAEVIGATUS (FERN.) BLAKE

PHELIPAEA CALIFORNICA (CHAM. & SCHLDL.) G. DON.
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL.

PHELIPAEA LUTEA PARRY
SEE: OROBANCHE FASCICULATA NUTT.

PHELIPARA COMOSA (HOOK.) A. GRAY
SEE: OROBANCHE CALIFORNICA CHAM. & SCHLDL. SSP. GRAYANA (BECK) HECKARD
PHOLISMA ARENARIUM NUTT. EX HOOK.
   ABRONIA UMBELLATA LAM.
   AMBROSIA DUMOSA (A. GRAY) PAYNE
   ASTERACEAE (SHRUBBY SPECIES)
   CHRYSOThAMNUS SP.
   CHRYSOThAMNUS NAUSEOSUS GRAVEOLENS (NUTT.) PIPER.
   CROTON SP.
   ERICAMERIA ERICOIDES (LESS.) H. & A.
   ERIODICTYON SP.
   ERIODICTYON TOMENTOSUM BENTH.
   ERIOGONUM PARVIFOLIUM SM. IN REES.
   FRANSERIA SP.
   HAPLOPAPPUS SP.
   HAPLOPAPPUS ERICOIDES (LESS.) H. & A.
   HYMENOCLEA SP.
   HYMENOCLEA SALSOI A. T. & G.

PHOLISMA SONORAE (A. GRAY) G. YATSKIEVYCH
   AMBROSIA SP.
   COLDENIA SP.
   ERIOGONUM SP.
   PLUCHEA SP.
   TQUILLIA SP.

PHORADENDRON SP.
   PLATANUS RACEMOSA NUTT.
   PRUNUS AMERICANA MARSH.

PHORADENDRON BOLLEANUM (SEEM.) EICH. SSP. PAUCIFLORUM (TORR.)
   SEE: PHORADENDRON PAUCIFLORUM TORREY

PHORADENDRON BOLLEANUM (SEEM.) EICH. VAR. PAUCIFLORUM (TORR.)
   SEE: PHORADENDRON PAUCIFLORUM TORREY

PHORADENDRON BOLLEANUM (SEEMAN) EICHLER SSP. DENSUM (TORR.) WI
   SEE: PHORADENDRON DENSUM TREL.

PHORADENDRON BOLLEANUM (SEEMAN) EICHLER VAR. DENSUM (TREL.) FO
   SEE: PHORADENDRON DENSUM TREL.
PHORADENDRON CALIFORNICUM NUTT.
ACACIA SP.
ACACIA GREGGII GRAY
CERATONIA SILIQUA L.
CERCIDIUM SP.
CONDALIA SP.
CONDALIA LYCOIOIDES GRAY
CONDALIA SPATHULATA A. GRAY
DALEA SP.
LARREA SP.
LARREA DIVARICATA CAV.
LARREA MEXICANA MURR.
OLNEYA SP.
OLNEYA TESOTA A. GRAY
PARKINSONIA SP.
PARKINSONIA ACULEATA L.
PARKINSONIA FLORIDA (BENTH. EX A. GRAY) S. WATS.
PROSOPIS SP.
PROSOPIS GLANDULOSA TORR. VAR.TORREYANA (L. BENSON) M. JOHNSTON
PROSOPIS PUBESCENS BENTH.
TAMARIX GALLICA L.

PHORADENDRON CALIFORNICUM NUTT. VAR. DISTANS TREL.
SEE: PHORADENDRON CALIFORNICUM NUTT.

PHORADENDRON CALIFORNICUM NUTT. VAR. LEUCOCARPUM (TREL.) JEPSO
SEE: PHORADENDRON CALIFORNICUM NUTT.

PHORADENDRON COLORADENSE TREL.
PROSOPIS SP.

PHORADENDRON DENSUM TREL.
CUPRESSUS SP.
CUPRESSUS ARIZONICA GREENE
CUPRESSUS MACNABIANA A. MURR.
CUPRESSUS SARGENTII JEPSON
JUNIPERUS SP.
JUNIPERUS CALIFORNICUS CARRIERE
JUNIPERUS OCCIDENTALIS HOOK.
JUNIPERUS OSTEOSPERMA (TORR.) LITTLE

MUNZ & KECK, 1973
MUNZ, 1975
HORST (WESTCOTT)
MUNZ & KECK, 1973
HORST (WESTCOTT)
MCMINN, 1964
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HORST (WESTCOTT)
MUNZ & KECK, 1973
MCMINN, 1964
UCR HERBARIUM
UCR HERBARIUM
USDA #165
HORST (WESTCOTT)
USDA #165
MUNZ & KECK, 1973
CDFA BOTANY HERBARIUM
UCR HERBARIUM
MUNZ & KECK, 1973

BEGA, 1978
USDA #165
HILGARDIA (1965) 37:115-153
CDFA BOTANY HERBARIUM
BEGA, 1978
CDFA BOTANY HERBARIUM
CDFA BOTANY HERBARIUM
MADRONO (1972) 21:395-401
PHORADENDRON DENSUM TREL. - continued
   PINUS MONOPHYLLA TORR. & FREM.  
MCMINN, 1964

PHORADENDRON DENSUM TREL. F. PARISH II TREL.
   SEE: PHORADENDRON DENSUM TORR.

PHORADENDRON DENSUM TREL. X PHORADENDRON JUNIPERINUM ENGELM.
   JUNIPERUS SP.
   JUNIPERUS OSTEOSPERMA (TORR.) LITTLE  
UCR HERBARIUM
   MADRANO (1972) 21:395-401

PHORADENDRON FLAVESCENTS (PURSH) NUTT.
   SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

PHORADENDRON FLAVESCENTS (PURSH) NUTT. VAR. MACROPHYLLUM ENGELM
   SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

PHORADENDRON FLAVESCENTS (PURSH) NUTT. VAR. VILLOSUM ENGELM.
   SEE: PHORADENDRON VILLOSUM (NUTT.) NUTT.

PHORADENDRON JUNIPERINUM A. GRAY
   JUNIPERUS SP.
   JUNIPERUS OCCIDENTALIS HOOK.
   JUNIPERUS OSTEOSPERMA (TORR.) LITTLE 
MUNZ, 1974
   MADRANO (1972) 21:395-401

PHORADENDRON JUNIPERINUM ENGELM. EX GRAY SSP. JUNIPERINUM
   SEE: PHORADENDRON JUNIPERINUM A. GRAY

PHORADENDRON JUNIPERINUM ENGELM. VAR. LIGATUM (TREL.) FOSB.
   SEE: PHORADENDRON JUNIPERINUM A. GRAY

PHORADENDRON JUNIPERINUM SSP. LIBOCEDRI (ENGELM.) WIENS
   SEE: PHORADENDRON LIBOCEDRI TORR.

PHORADENDRON JUNIPERINUM VAR. LIBOCEDRI ENGELM.
   SEE: PHORADENDRON LIBOCEDRI TORR.

PHORADENDRON LIBOCEDRI (ENGELM.) HOWELL
   CALOCEDRUS DECURRENS (TORR.) FLORIN
PHORADENDRON PAUCIFLORUM (TORR.) WIENS (HYPERPARASITISM) 
BEGA, 1978
   PLANT DISEASE REPORTER (1970) 54:15
PHORADENDRON LIGATUM TREL.
SEE: PHORADENDRON JUNIPERINUM A. GRAY

PHORADENDRON LONGISPICUM TRELL.
SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL
ACACIA MELANOXYLON R. BR.
ACER SP.
ACER NEGUNDO L.
ACER SACCHARINUM L.
AESCULUS CALIFORNICA (SPACH.) NUTT.
ALNUS SP.
ALNUS RHOMBIFOLIA NUTT.
BETULA SP.
CASTANEA SP.
CEANOTHUS CRASSIFOLIUS TORR.
CELTIS SINENSIS PERS.
DIOSPYROS SP.
DIOSPYROS KAKAI L.
FRAXINUS SP.
FRAXINUS DIPETALA H. & A.
FRAXINUS HOLOTRICHA KOEHN X F. PALLISAE WILMONT ‘MORAINE’
FRAXINUS LATIFOLIA BENTH.
FRAXINUS VELUTINA TORR.
FRAXINUS VELUTINA TORR. VAR. GLabra REHD. ‘MODESTO
GLEDESTIA TRIACANTHOS L.
GLEDESTIA TRIACANTHOS L. F. SP. INERMIS (PURSH) C.K. SCHNEID.
JUGLANS SP.
JUGLANS CALIFORNICA WATS.
JUGLANS HINDSII (JEPSON) JEPSON
JUGLANS REGIA L.
OLEA EUROPAEA L. VAR. ‘MISSION’
PLATANUS SP.
PLATANUS RACEMOSA NUTT.
POPULUS SP.
POPULUS FREMONTII WATS.
PROSOPIS SP.
PROSOPIS GLANDULOSA TORR. VAR. TORREYANAA (L. BENSON) M. JOHNSTON
PRUNUS AMERICANA MARSH.
PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL - continued

- PRUNUS DULCIS (MILL.) D.A. WEBB
- PRUNUS MAHALEB L.
- PRUNUS PERSICA L.
- QUERCUS SP.
- QUERCUS DOUGLASII HOOK. & ARN.
- ROBINIA PSEUDOACACIA L.
- SALIX SP.
- SALIX BABYLONICA L.
- SALIX EXIGUA NUTT.
- SALIX GOODDINGII BALL.
- SALIX LAEVIGATA BEBB
- SALIX LASIANDRA BENTH.
- SOPHORA JAPONICA L.
- ULMUS AMERICANA L.
- ULMUS MINOR MILL.
- UMBELLULARIA CALIFORNICA (H. & A.) NUTT.
- ZELKOVA SERRATA MAKINO

FRENCH, 1989

CDFA BOTANY HERBARIUM

PHORADENDRON PAUCIFLORUM TORR.

- ABIES SP.
- ABIES CONCOLOR (GORD. & GLEND.), LINDL. EX HILDEBR
- CUPRESSUS SP.
- CUPRESSUS MACNABIANA A. MURR.
- CUPRESSUS SARGENTII JEPSON
- PHORADENDRON PAUCIFLORUM TORR. (AUTOPARASITISM)

MUNZ, 1974

BEGA, 1978

MUNZ & KECK, 1973

CDFA BOTANY HERBARIUM

EL ALISO (1948) 1:257-321

PLANT DISEASE REPORTER (1970) 54:15

PHORADENDRON TOMENTOSUM (DC.) ENG. SSP. MACROPHYLLUM (ENG.) WI
SEE: PHORADENDRON MACROPHYLLUM (ENGELM.) COCKERELL

PHORADENDRON TOMENTOSUM SUBSP. VILLOSUM X P. VILLOSUM NUTT.

- PLATANUS RACEMOSA NUTT.

MADRONO (1972) 21:395-401

PHORADENDRON VILLOSUM (NUTT.) NUTT.

- ADENOSTOMA SP.
- AESCULUS CALIFORNICA (SPACH.) NUTT.
- ALNUS SP.
- ALNUS RHOMBIFOLIA NUTT.
- ARCTOSTAPHYLLOS SP.
- ARCTOSTAPHYLLOS MANZANITA PARRY

MCMINN, 1964

USDA #165

HORST (WESTCOTT)

USDA #16

HORST (WESTCOTT)

USDA #165
PHORADENDRON VILLOSUM (NUTT.) NUTT. - continued

ARCTOSTAPHYLOS PATULA GREENE
CASTANEA DENTATA (MARSH.) BORKH.
CASTANOPSIS SP.
FORESTIERA NEOMEXICANA GRAY
FRAXINUS SP.
PHORADENDRON PAUCIFLORUM TORR. (HYPERPARASITISM)
PLATANUS RACEMOSA NUTT.
POPULUS SP.
QUERCUS SP.
QUERCUS AGRIFOLIA NEE
QUERCUS CHERYSOLEPIS LIEBM.
QUERCUS DOUGLASII HOOK. & ARN.
QUERCUS GARRYANA DOUGL.
QUERCUS KELLOGGII NEWB.
QUERCUS LOBATA NEE
QUERCUS WISLIZENII A. DC.
QUERCUS WISLIZENII VAR.FRUTESCENS ENGEL.
RHUS SP.
UMBELLULARIA CALIFORNICA (H. & A.) NUTT.

PHORADENDRON VILLOSUM (NUTT.) NUTT. SSP. VILLOSUM WIENS
SEE: PHORADENDRON VILLOSUM (NUTT.) NUTT.

PHORADENDRON VILLOSUM VAR. ROTUNDIFOLIUM TREL.
SEE: PHORADENDRON VILLOSUM (NUTT.) NUTT.

PILOSTYLES THURBERI GRAY
PSOROTHAMNUS EMORY\(\ddagger\) (A. GRAY) RYDB.

RAZOUMOFSKYA AMERICANUM KUNTZ
SEE: ARCEUTHOBIFLUM AMERICANUM NUTT. EX ENGELM. IN GRAY

RAZOUMOFSKYA BLUMERI STANDLEY
SEE: ARCEUTHOBIFLUM CAMPYLOPODUM ENGELM. IN GRAY

RAZOUMOFSKYA CAMPYLOPODA (ENGELM.) KUNTZE
SEE: ARCEUTHOBIFLUM CAMPYLOPODUM ENGELM. IN GRAY

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