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Annotated Checklist of California Encyrtidae (Hymenoptera)

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Table of contents

Abstract

Based on examination of the literature and specimens, 208 described species in 90 genera of Encyrtidae are listed from California. Data on the original publication, deposition of types, geographic distribution and host records of these species are presented. Forty-three species were established in biocontrol programs, 157 are presumed native, 7 appear to be adventitious introductions, and the origin of one is undetermined. An additional 276 morphospecies are also listed as present

in the state within an additional 21 described genera and potentially up to 20 undescribed genera. Altogether, 31 new genera and 36 new species are recorded for the state, as well as 70 new parasitoid-host records.

Errors pertaining to California taxa in previously published papers are corrected. *Metaphycus immaculatus* (Howard) is reported as a **new combination** (from *Aphycus* Mayr).

Three appendices are included: a host/parasitoid listing for the described species present in the state, a listing of taxa previously reported from California under invalid names, and a list of taxa either erroneously reported from the state, or unsuccessful biocontrol introductions.

Key words: Biodiversity, new host records, new state records

Introduction

"Among the many thousands of minute Hymenopterous insects existing in the world and to which have been given the popular name Chalcid flies, there is probably no single family that is of more interest or of greater economic importance than the family Encyrtidae." Ashmead, 1900.

"From a distance, this is the most unlikable family in the chalcidoid series but close acquaintance reveals so many fascinating qualities that students, after some experience, will no doubt choose it as a favorite … the whole diverse and varied panorama is such that the most torpid of interests must finally become conscious of a spell." Girault, 1915.

A century has passed since W.H. Ashmead and A.A. Girault penned these statements as introductions to their respective treatments of the family Encyrtidae, but they certainly bear repeating today. Not only is this group one of the largest and most diverse families of the parasitic Hymenoptera, but many species have proven to be of immense economic benefit through their use in biological control programs of agricultural pests.

Over the past three decades, there have been major treatments of the family of the Neotropical (Noyes 1980, 2000, 2004, 2010), Palaearctic (Trjapitzin 1989; Guerrieri & Noyes 2000, 2005; Zhang & Huang 2004), Oriental (Noyes & Hayat 1994; Hayat 2006) and Australian (Noyes 1988b; Dahms & Gordh 1997) faunas. In contrast, the fauna of the United States has never been studied systematically, although keys to the Nearctic genera were produced by Trjapitzin & Gordh (1978a, b) and Noyes *et al.* (1997), and a checklist of the Mexican species was compiled by Trjapitzin & Ruiz-Cancino (1995).

Within the Nearctic region, there is greater ecological diversity in California than in any other area of comparable size, which predicts a rich endemic fauna in the state. Considering all taxa, California has both the highest total number of species as well as the highest number of endemic species of any state in the union (Salwasser 2003). Noyes (2001) recorded 118 apparently native species of encyrtids from California, comprising 25% of the 468 species then known from the United States. Another 10 species have been recorded from the state by other workers, for a total of 128 native species reported in the state prior to this study.

Five workers authored the majority of described Californian encyrtids: W.H. Ashmead, L.O. Howard, A.A. Girault, P.H. Timberlake and H. Compere. The works of the former three were notoriously short and typically unaccompanied by illustrations. In contrast, Timberlake and Compere, both of whom were involved in research and implementation of biological control programs, produced superior (and in Compere's case, well-illustrated) descriptions and systematic works that are still largely useful today. This reflects the case that the study of Californian encyrtids in the 20th century was largely that of agents introduced into the state in biological control programs, notably for those species attacking economically important pests in the Central and Imperial Valleys, or the coastal plain from San Diego north to San Francisco, while studies of native, non-economic species occupied an ancillary role. Thus, while the biologies of many imported species are well elucidated, much less is known about the endemic taxa.

In the mid 1970s an exchange program between the US National Academy of Sciences and the USSR Academy of Sciences led to collaboration between two prestigious specialists, Gordon Gordh and Vladimir A. Trjapitzin, which marked a reenergization in the study of endemic encyrtids from the Nearctic region. Although the native California fauna still remains largely unstudied, Trjapitzin has continued to author a long series of papers on the Mexican fauna (see references in Trjapitzin *et al.* 2008), which share a number of species with the California fauna.

Coincident with the paucity of published works on California Encyrtidae, the number and diversity of specimens found in museum collections are generally quite poor. Due to their small size, general collectors do not

often take encyrtids. Worse, specimens of many species shrivel up when air-dried, making them difficult or impossible to identify, even to the generic level. Fortunately, the use of critical point drying (Gordh & Hall 1979) and hexamethyldisilizane (HMDS) (Brown 1993) treatments for point-mounted specimens, and the use of good media for slide-mounted specimens, now provide workers with more reliable methods for preserving minute specimens in excellent condition. Within the state, the best collections of parasitic Hymenoptera are museums at the three campuses of the University of California with Entomology or Biological Control programs: Essig Museum (Berkeley), Bohart Museum (Davis) and the Entomological Research Collection (Riverside). Nevertheless, large areas of the state have never been properly sampled for the encyrtids, and many undescribed species and genera remain to be named.

Therefore, a definitive treatment of the California Encyrtidae is years (if not decades) away, so it may be argued that a checklist of the group is premature. Indeed, it would be a serious mistake to expect this paper to reflect the full diversity of the state's encyrtids—instead it should be regarded only as a foundation upon which later workers can build. However, I believe the publication of such a checklist now is worthy, based on the fragility of the state's ecosystem. The California Floristic Province has been identified as one of the world's biological hotspots (defined by Myers *et al.* 2000 as an exceptional concentration of endemic species experiencing an exceptional loss of habitat). For example, many encyrtids are parasitoids of scales (Hemiptera: Coccoidea), and native California scales appear to be in a decline (R. Gill, pers. comm.), suggesting their endemic parasitoids may be threatened as well.

Methods

As my basic framework, I used Noyes' interactive catalog of world Chalcidoidea (2001), selecting both native and introduced species recorded from California. Other references I relied upon heavily were Peck's (1963) and Gordh's (1979) treatments of the Nearctic fauna, the host/parasitoid listing presented in Noyes & Hayat (1994), and Clausen's (1978a) review of introduced natural enemies. I supplemented this initial listing with subsequent literature searches, always attempting to check distribution and host records against original sources. These searches included a Web of Science alert program, consulting the Universal Chalcidoidea Database (Noyes 2015) as well as examinations of hard-copy references, mostly from the collections of the Biosciences Library and Essig Museum (both University of California, Berkeley), the Research Library of the California Academy of Sciences (San Francisco), and my personal library. Additional distribution records for some *Copidosoma* species were obtained from Dr. Greg Zolnerowich's unpublished revision of the Nearctic fauna of that genus.

I examined specimens from the following institutions (see below for key to codons): CAS, CSCA, EMEC, EMUS, LACM, RLZC, SBMN, SJSC, UCDC, UCFC, UCMC, UCRC, USNM, and WSU. In general, I accepted the specific determinations previously assigned to these specimens, as well as the hosts noted on collecting labels, and identified a number of undetermined specimens to either genus or species.

Since 2001, I began devoting my personal collecting efforts towards the encyrtids of California. This activity encompassed the entire state, although the bulk of my efforts have been within a two-hour drive of the San Francisco Bay area. Most specimens were collected by sweeping vegetation, with a smaller number taken via malaise traps, although a surprisingly varied number of species were skimmed from a Marin County swimming pool. Collection records of these specimens are maintained in a Microsoft Access file.

I have organized my results into four parts: the checklist itself and three appendices.

The checklist is presented as an alphabetical listing (by subfamily, genus and species) of the Encyrtidae. Subfamilial headings are not further notated, but generic headings include the author and date of publication, and if not been previously reported from California, the notation [**New state record**] is appended. Additionally, if the genus has described species from California with reliably known hosts, the order and family of those hosts are listed as well, in order to facilitate matching parasitoids with hosts in Appendix I (NB: the order and family of hosts of extralimital species, if different, are not included). Authors of Encyrtidae taxa are included in the checklist proper, while authors of host taxa are included in Appendix I.

Within a genus, described species are listed alphabetically. Undescribed or questionable taxa are typically treated under the epithet "spp.", and placed after the described species (e.g. the order of taxa listed for *Tetracnemoidea* is *brevicornis*, *peregrina*, *sydneyensis*, spp.).

Specimens belonging to species for which I was unable to assign a genus are included at the end under "Undetermined Genera".

Each described species entry may have up to the following five sections:

1. **Original publication data**. The species epithet is followed by the author, date of publication, the starting page number of its description, and the name of the original genus (in parentheses) if different from the present combination. If a described species has not been reported from California before, the notation [**New state record**] is appended, along with the institutional codon (see below) where the specimens are deposited.

2. **Type**. The institution where primary types are deposited is listed as a codon, mostly based on those from the Bishop Museum website: http://hbs.bishopmuseum.org/codens/. The key to these codons is as follows:

ANIC	Australian National Insect Collection, CSIRO, Canberra, ACT, Australia
BMNH	The Natural History Museum [=British Museum of Natural History], London, United Kingdom
BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii
CAS	California Academy of Sciences, San Francisco, California
CNC	Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario, Canada
CSCA	California State Collection of Arthropods, Sacramento, California
CUMZ	Zoological Museum, Cambridge University, Cambridge, United Kingdom
DEZA	Dipartimento di Entomologia e Zoologia Agraria, Università di Napoli, Portici, Italy
EMEC	Essig Museum of Entomology, University of California, Berkeley, California (=California Insect Survey)
EMUS	Utah State University Insect Collection, Utah State University, Logan, Utah.
EUMJ	Ehime University, Matsuyama, Japan
HMHN	Hungarian Natural History Museum, Budapest, Hungary
IAEC	Institute of Agricultural Entomology, University of Catania, Italy
INBio	Instituto Nacional de Biodiversidad, Santa Domingo de Heredia, Costa Rica
INPC	National Pusa Collections, Indian Agriculture Research Institute, New Delhi, Haryana, India
ITLJ	National Institute of Agro-Environmental Sciences, Tsukuba, Ibaraki, Japan
LACM	Los Angeles County Museum of Natural History, Los Angeles, California
MACN	Museo Argentina de Ciencias Naturales, Buenos Aires, Argentina
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MNMS	Museo Nacional de Ciencias Naturales, Madrid, Spain
MLPA	Museo de la Plata, Universidad Nacional de La Plata, La Plata, Argentina
NHRS	Naturhistoriska riksmuseet, Stockholm, Sweden
NMW	Naturhistorisches Museum Wien, Vienna, Austria
NZAC	New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand
OSU	Museum of Biological Diversity, Ohio State University, Columbus, Ohio
OUNH	Museum of Natural History, Oxford University, Oxford, United Kingdom
PPRI	Plant Protection Research Institute, Pretoria, Gauteng, South Africa
QM	Queensland Museum, South Brisbane, Queensland, Australia
RLZC	Personal collection of author (ultimately to be deposited in the EMEC)
ROM	Royal Ontario Museum, Toronto, Ontario, Canada.
SANC	South African National Collection of Insects, Pretoria, South Africa
SBMN	Santa Barbara Museum of Natural History, Santa Barbara, California
SEMC	Snow Entomological Museum, University of Kansas, Lawrence, Kansas
SJSC	J. Gordon Edwards Museum of Entomology, San Jose State University, San Jose, California
UCDC	Bohart Museum of Entomology, University of California, Davis, California
UCFC	Stuart M. Fullerton Collection of Arthropods, University of Central Florida, Orlando, Florida
UCMC	University of Colorado Museum of Natural History, University of Colorado, Boulder, Colorado
UCRC	Entomology Research Museum, University of California, Riverside, California
USNM	National Museum of Natural History (=United States National Museum), Washington, D.C.
WSU	Maurice T. James Entomological Collection, Washington State University, Pullman, Washington
ZDAMU	Department of Zoology, Aligarh Muslim University, Aligarh, Uttar Pradesh, India
ZIN	Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
ZMUM	Moscow State University, Moscow, Russia

3. **Distribution.** Each entry has two parts: a letter code indicating the species distribution on a worldwide basis, followed (in parentheses) by the county (in normal font) and/or *region* (*in italic font*) where the taxon has been recorded within California. In the few cases where I have been unable to determine the California locality, I noted it with a question mark (?). Key to letter code:

C Endemic to California
N Endemic to the Nearctic Region, including California
W Naturally occurring in California and at least one other biogeographic area
E Established in California (in a biological control program)
A Accidentally introduced into California
U Unknown

4. **Host/habitat.** Only those hosts whose association I consider either proven or highly likely are listed (questionable or mistaken host records are discussed under next section), and are cross-indexed in Appendix I. Hosts are listed alphabetically (regardless of higher classification) and include those recorded worldwide, not just those from California. Previously reported hosts are listed first, followed by any new records (preceded by the notation **NEW**) and include the codon of the collection from which these records were taken. For taxonomic information of scales and mealybugs, I relied upon ScaleNet (http://www.sel.barc.usda.gov/scalenet/scalenet.htm). If the hosts are unknown, I endeavored to include the plant or habitat from which the species has been collected. Unless specifically noted, all species are presumed to be primary parasitoids. For known hyperparasitoids, the primary hosts are listed first, followed by the primary parasitoids; if there are multiple primary hosts and/or parasitoids listed, I did not endeavor to determine whether any specific primary parasitoid attacked any specific primary host. Recorded hosts from laboratory studies are included, but not instances of parasitoids that accepted hosts for oviposition but failed to produce progeny.

5. **Remarks**. Miscellanous notes and clarifications for described species are recorded (this is also the only section I presented for undetermined species). Noyes & Hayat (1994) included a summary of all encyrtid species used in biological control programs, but they did not indicate those programs that failed because the target species turned out to be not a true host of the parasitoid. Unfortunately, the associations between these unsuitable target species and the imported parasitoid were then carried forward into Noyes (2001), where the unsuitable target species were listed under "Hosts" of the encyrtids, thus giving the misimpression that a true host/parasitoid relationship existed. I have endeavored to point out this discrepancy in the Remarks section for each encyrtid species so involved, with the statement "not a proven host (see Methods)".

One of the inherent weaknesses in preparing secondary works such as this one is the heavy dependence placed upon previously published sources, which can lead to the perpetuation of initial errors of misidentification and distribution (Noyes 1994). A complementary danger is adding more errors to the literature, thus increasingly widening the circle of misinformation. With this in mind, I tried to heed the physician's maxim to "First do no harm", and adopted the approach that I deemed the most conservative. In general I recognize four major sources of possible errors in this paper.

1. Misidentifications of parasitoids or their hosts in previously published works. To minimize the mistakes introduced by secondary sources, whenever possible I consulted the original papers describing the parasitoids' distribution and host records. With the exception of *Psyllaephagus trioziphagus* (in Cazier 1964), I accepted as valid all identifications found in original research papers. Published records that I considered erroneous or questionable are discussed in the Remarks section.

2. Genera with variable species. There are several genera (e.g. *Anagyrus*) present in California which include both undescribed as well as morphologically variable described species, making it difficult (in the absence of a review of the genus) to determine if any given specimen represented a new species or not. I usually treated these taxa as undetermined species.

3. Incomplete label data. During the course of various biocontrol programs in California, quarantine and insectary facilities were established in the counties of Alameda (Albany), Los Angeles (Downey, Pasadena and Whittier), Riverside (Riverside) and Ventura (Fillmore). Regrettably, some museum specimens are simply labelled by these localities, and it is not clear if they represent locally collected populations, or imported taxa reared in these facilities. In the absence of further data, I chose to exclude the distributional data from these specimens (although I did include their host records).

4. Misidentifications of extant museum material. The identification of encyrtid specimens in the collections I examined spanned over 100 years and dozen of workers. Thus, a certain variation in the reliability of these determinations is to be expected. In a small percentage of cases, I corrected some misidentifications, but in general I accepted these pre-existing determinations. It is possible that I missed some erroneous determinations, or made mistakes in my own identifications.

Three appendices are included. Appendix I is a host-parasitoid listing (presented systematically by host order, then alphabetically by host family, genus and species). Encyrtid hyperparasitoids appear twice in this listing: under the name of the primary parasitoid, and again under the name of the herbivore, where it is designated with an (H). New host associations are followed by NEW: (collection codon). Appendix II is an alphabetical list of encyrtid taxa previously reported from California under currently invalid names. The names listed are those under which the taxa were known by when they were reported from California (not necessarily the original name). Appendix III is an alphabetical list of introduced species that did not become permanently established, and other species that have mistakenly been reported from the state.

Results and discussion

Encyrtinae

Acerophagus E. Smith 1880

Hosts. Hemiptera: Coccidae, Dactylopiidae, Diaspididae, Pseudococcidae

abstrusus (Gahan 1946: 316) (*Pseudaphycus*)

Type. USNM

Distribution. W (Imperial)

Host/habitat. *Pseudococcus comstocki, P.* sp., *Spilococcus pressus*

angelicus (Howard 1898a: 245) (*Aphycus*)

Type. USNM

Distribution. N (Alameda, Fresno, Imperial, Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, Santa Clara, Santa Cruz, Stanislaus, Tulare, Ventura)

Host/habitat. *Dysmicoccus brevipes*, *D. ryani*, *Ferrisia virgata*, *Formicococcus njalensis*, *Phenacoccus gossypii*, *P.* ?*maderiensis*, *Planococcus citri*, *Pseudococcus calceolariae*, *P. longispinus*, *P. maritimus*, *P.* sp., *Spilococcus implicatus*; **NEW**: *Phenacoccus colemani*, *P. pergandei*, *P. solani* (all UCRC)

Remarks. The natural range of this species is restricted to the western United States, but there are two incongruous records, from Quebec, Canada (Gordh 1979: 927) and Bermuda (de Santis 1989: 41). The record from Quebec traces back to the citation in Peck (1963: 398) that refers to its importation from California in a biocontrol program against *P. maritimus* in greenhouses (Burnett 1947). Similarly, the citation by de Santis presumably traces back to its use in a biocontrol program against *P. longispinus* in Bermuda in 1951, although it failed to establish there (Bennett & Hughes 1959), and Hilburn *et al.* (1990) did not list it in their list of Bermuda Hymenoptera. A series of specimens was reportedly reared from *Saissetia oleae* (EMEC), but I suspect this is an error in identification. Another specimen (EMEC), determined as near *angelicus*, was reared from *Spilococcus mamillariae* in Alameda County.

antennalis Rosen 1969: 50

Type. USNM

Distribution. C (Los Angeles)

Host/habitat. *Dysmicoccus ryani*

californicus Rosen 1969: 68

Type. UCRC

Distribution. C (Imperial)

Host/habitat. *Spilococcus pressus*

Remarks. A specimen determined possibly as *A. californicus* was collected from Riverside County (UCRC). Two other specimens were collected together from *Adenostoma fasciculatum* (Rosaceae) in Marin County (RLZC): a macropterous female resembling *A. californicus*, and a brachypterous female.

citrinus (Howard 1898a: 235) (*Rhopoideus*)

Type. USNM

Distribution. N (Nevada)

Host/habitat. Unknown

Remarks. Howard (1898a) reported *Diaspidiotus pernicious* (repeated in Quaintance 1915) and *Tortrix* sp. as hosts. The latter is clearly a mistake, while Timberlake (1916) opined that the former was likely to be in error as well, based on the host records of related species. *Aulacaspis rosae* was also reported as a host in Peck (1951, 1963), who mistakenly attributed this to Ashmead (1900: 408)—Ashmead instead listed only *D. perniciosus*.

coccois E. Smith 1880: 84

Type. USNM

Distribution. N (Los Angeles, Riverside, Tulare)

Host/habitat. *Oracella acuta*, *Phenacoccus acericola*, *P. aceris*, *P. gossypii*, *P. herreni*, *P. maderiensis*, *P. manihoti*; **NEW**: *Pseudococcus comstocki* (UCRC)

Remarks. Timberlake (1916) reported the locations of the types are not known, but Rosen (1969) redescribed the species from a cotype. The host record of *Pulvinaria vitis* (Linnaeus) attributed by Peck (1963: 401) to Howard (1895b) is incorrect.

fasciipennis Timberlake 1918: 348

Type. USNM

Distribution. C (Los Angeles, San Bernardino, Ventura)

Host/habitat. *Anisococcus crawii*; **NEW**: *Dysmicoccus ryani* (UCRC)

flavidulus (Brèthes 1916: 424) (*Psilomirinus*)

Type. MACN

Distribution. E (San Luis Obispo)

Host/habitat. *Pseudococcus viburni*, *Pseudococcus* sp.

Remarks. This is a South American species, and material from Chile was used to begin an insectary colony in that country. Material from that colony was released from 1997–1999 in a biocontrol program against *Pseudococcus viburni* in San Luis Obispo and Santa Barbara counties, and the species was recovered in the former county almost ten years later, albeit at low rates (Daane *et al.* 2008). In the original description, this species was reportedly reared from the diaspidid, *Diaspis* (=*Pseudaulacaspis*) *pentagona*, but Noyes (2001) considers this an error.

maculipennis (Mercet 1923: 140) (*Pseudaphycus*)

Type. MNMS

Distribution. E (San Luis Obispo)

Host/habitat. *Pseudococcus maritimus, P. viburni*

Remarks. This is a Palearctic species that has been used successfully in New Zealand to control *P. viburni* (Daane *et al.* 2008). In 2006, material from New Zealand was brought into California quarantine, but has not yet been released (Daane, pers. comm.). Nevertheless, this species was reared from *P. viburni* in San Luis Obispo County in 2007.

malinus (Gahan 1946: 317) (*Pseudaphycus*)

Type. USNM

Distribution. E (Kern, Stanislaus, Tulare)

Host/habitat. *Coccura suwakoensis*, *Pseudococcus comstocki*, *P. cryptus*; **NEW**: *Pseudococcus longispinus* (UCRC)

Remarks. This species was established after being introduced from Japan in a biological control program against *Pseudococcus comstocki* in the 1970s (Meyerdirk & Newell 1979). *Dysmicoccus brevipes* has been cited as a host (Noyes 2001), based on the use of *P. malinus* in a biocontrol program against that species (Bartlett 1978c), but there are no records of the parasitoid attacking the mealybug. *Pulvinaria vitis* has been cited as a host of this species in the USSR (Shutova & Kukhtina 1955), but I suspect this is a misidentification of the host.

notativentris (Girault 1917b: 10) (*Pseudaphycus*)

Type. USNM

Distribution. N (Fresno, Kern, Los Angeles, Santa Clara, Solano, Stanislaus, Tulare)

Host/habitat. *Dysmicoccus ryani*, *Eurycoccus blancharidii*, *Ferrisia virgata*, *Formicococcus njalensis*, *Pseudococcus comstocki*, *Pseudococcus maritimus*, *Pseudococcus viburni*, *Pseudococcus* sp.

pallidus Timberlake 1918: 350

Type. USNM

Distribution. C (Kern, Ventura)

Host/habitat. *Ferrisia virgata*, *Formicococcus njalensis*, *Phenacoccus gossypii*, *P. madeirensis*, *P. solani*, *Pseudococcus maritimus*, *Spilococcus atriplicis*, *S. eriogoni*

texanus (Howard 1898a: 245) (*Aphycus*)

Type. USNM

Distribution. E (Imperial)

Host/habitat. *Ferrisia virgata*

Remarks. This species was imported from Mexico and released from 1966–1967 (DeBach & Warner 1969)

spp.

Remarks. Specimens determined as *Acerophagus* "*meracus* or near" were collected from Tulare county (UCRC). There are undetermined specimens of this genus from Alameda, Calaveras, Contra Costa, Lassen, Modoc, San Bernardino, San Joaquin, San Mateo, Santa Barbara, Santa Clara, Stanislaus, Tulare, Tuolumne and Ventura counties (CSCA, EMEC, RLZC, SJSC, UCFC), including a series (EMEC) recorded from *Spilococcus sequoiae*.

Adelencyrtus Ashmead 1900

Hosts. Hemiptera: Coccidae, Diaspididae

aulacaspidis (Brèthes 1914: 29) (*Prionomitus*)

Type. MACN

Distribution. W (Alameda, Contra Costa, Los Angeles, Marin, Ventura)

Host/habitat. *Aulacaspis difficilis*, *A. rosae*, *Chionaspis salicis*, *Diaspidiotus macroporanus*, *Lepidosaphes cupressi*, *Pseudaulacaspis pentagona, Rhizopulvinaria nevesi*

odonaspidis (Fullaway 1913: 27) [**New State record**] (RLZC)

Type. USNM

Distribution. A (Marin, Stanislaus)

Host/habitat. *Duplachionaspis sansevieriae*, *Odonaspis ruthae*, *O. saccharicaulis*, *O.* sp.

Remarks. Burks (1958b) reported a questionable host record of *Antonia graminis*, but I suspect this was due to a misreading of the host "*Odonaspis graminis*" as reported in the original description. While *O. graminis* Bremner remains a valid species, the host of *A. odonaspidis* in Hawaii is actually *O. ruthae* (Ben-Dov 2006c). The host record of "*Odonaspidis* sp." (Noyes 2015) is probably referrable to a misspelling of *Odonaspis*. Although

originally described in Hawaii, Timberlake (1919a) reported that its true place of origin was unlikely, but opined it may be from the warmer areas of Europe or Asia. The species has also been recorded from South Africa, Japan, Mexico, Brazil and the southeastern USA (Noyes 2001), and was introduced into Bermuda in a biocontrol program against *O. ruthae* (but failed to establish). I consider its presence in California as an adventitious introduction.

Agarwalencyrtus Hayat 1981 [New State record] (UCRC)

spp.

Remarks. An undescribed species (near *A. euroxes* Noyes 2010) was collected in a pan trap under *Adenostoma* sp. in Riverside County (UCRC).

Ageniaspis Dahlbom 1857

Hosts. Lepidoptera: Gracillariidae, Nepticulidae

bicoloripes (Girault 1915e: 172) (*Paraleurocerus*)

Type. USNM

Distribution. N

Host/habitat. *Caloptilia* sp., *Cameraria caryaefoliella*, *C. cincinnatiella*, *C. diabloensis*, *C. gaultheriella*, *C. ulmella*, *C.* sp. probably *wislizeniella*, C. sp., *Marmara fraxinicola*, *Phyllonorycter* sp., *Stigmella inconspicuella*, *S.* sp. **NEW**: *Cameraria hamameliella*, *C. quercivorella*, *Phyllonorycter rileyella* (EMEC)

Remarks. This species was recorded from California by Gates *et al.* (2002), without detailed locality data. Gordh (1979: 920–921) regarded *Gibberella scutellata* Miller, 1961 as a junior synonym of *A. bicoloripes*, and included the host record of *Phyllonorycter lucetiella* (Clemens) (as *Lithocolletis lucetiella*) as originally noted by Miller (1961). Noyes (2001) treated them as separate species, but mistakenly transferred the host record of *P. lucetiella* to *A. bicoloripes*.

spp.

Remarks. Specimens (including some reared from *Argyresthia cupressella*, *Phyllonorycter inusitatella* and *Cameraria* sp.) that appear to represent three species of this genus were collected from Alameda, Calaveras, Contra Costa, Humboldt, Los Angeles, Mendocino, Monterey, Orange, Riverside, San Bernardino, San Diego, San Francisco, San Mateo, Santa Cruz, Siskiyou, Solano, Tehama and Ventura counties (CSCA, EMEC, RLZC, UCDC, USNM).

Agromyzaphagus Gahan 1912

Hosts. Diptera: Chamaemyiidae

detrimentosus Gahan 1912: 7

Type. USNM

Distribution. W (Alameda, Contra Costa, El Dorado, Fresno, Inyo, Los Angeles, Modoc, Orange, Placer, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Clara, Shasta, Solano, Ventura, Yolo)

Host/habitat. *Leucopis glyphinivora*, *L.* ?*minor*

Remarks. Host records (dating to the 1930s) from EMEC and UCRC include "*Leucopis griseola*". This is a Palearctic species, and is probably a misidentification of the Holarctic *L. annulipes* Zetterstedt (S. Gaimari, pers. comm.).

Ammonoencyrtus De Santis 1964

Hosts. Hyperparasitoid of Hemiptera: Coccidae via Hymenoptera: Encyrtidae

californicus (Compere 1925: 304) (*Eusemion*)

Type. USNM

Distribution. C (Alameda, Contra Costa, Los Angeles, Marin, Orange, Riverside, San Diego, Santa Barbara, Ventura, *southern San Joaquin Valley*)

Host/habitat. Hyperparasitoid of *Ceroplastes cirripediformis*, *Coccus hesperidum*, *Saissetia oleae* via *Metaphycus lounsburyi, Microterys nietneri*; **NEW**: *Eulecanium kunoense* (EMEC), *Parthenolecanium corni*, *P. quercifex*, *Pulvinariella mesembryanthemi* (UCRC)

Remarks. This species was first referred to by Timberlake (1913) as "*Eusemion* n. sp.". A specimen from Contra Costa County (EMEC), reported from *E. kunoense*, is placed here, although it lacks the characteristic dark color of *A. californicus* (possibly from being stored in alcohol for several years). Bernal *et al.* (2001) reported this species on citrus (Rutaceae) from the southern San Joaquin Valley (Fresno, Kern and Tulare counties) without specifying exactly which county this species occurred in. They also reared this species from a batch of *Coccus pseudomagnoliarum*, noting that the exact host still needs to be confirmed.

Anicetus Howard [in Howard & Ashmead] 1896

Hosts. Hemiptera: Coccidae

annulatus Timberlake 1919b: 227

Type. USNM

Distribution. E (Alameda, Sacramento, San Francisco, Santa Clara)

Host/habitat. *Ceroplastes ceriferus*, *Coccus hesperidum*, *C. pseudomagnoliarum*, *C. viridis*, *Eucalymnatus tessellatus*, *Eulecanium* sp., *Pulvinaria aurantii*, *P. kuwacola*, *P. polygonata*, *P. psidii*, *Saissetia coffeae*, *S. oleae*

Remarks. Timberlake (1913) noted this species in California in 1912 (as *Anicetus* sp.), although this record may represent specimens escaped from the State Insectary Laboratory in Sacramento. In 1922–23, a handful of individuals were released in Los Angeles County (Smith 1923), while large-scale releases started only in 1931, with material imported from Australia & Taiwan during several biocontrol programs (Bartlett 1978a). Trjapitzin & Ruiz Cancino (2009) reported two locations that are misreadings of the collection data. The first was reported as "ex *Coccus* sp. on *Aralia*, on Yenyo Marin Beach (San Francisco, Cal.) in 1922." In actuality, the label reads "Taiyo Maru boat"—these specimens originated from a plant used as an ornamental on a Japanese steamer, which had docked in San Francisco (Compere 1924). The second was reported as "1 mile south of Centerville near Niliss, Calif., Dec. 1, 1940 (Flanders & Finney)", but the label reads "Niles" (not Niliss), and notes that the specimen was reared from a scale on an orange tree. There are about ten "Centervilles" in the State of California, but this site is probably the one in Alameda County that is now part of the Niles district of Fremont. Timberlake (1913) initially reported this species as a hyperparasitoid, but in the formal description (taken from a Hawaiian population) he confirmed it is a primary (1919b).

Aphycaspis Hoffer 1954 [New state record]

Hosts. Neuroptera: Coniopterygidae [**New host record**]

spp.

Remarks. An undescribed species of this genus has been collected in Alameda, Calaveras, Contra Costa, El Dorado, Imperial, Inyo**,** Kern, Lake, Lassen, Los Angeles, Marin, Orange, Riverside, San Benito, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Stanislaus, Tuolumne and Ventura counties (CSCA, RLZC, UCDC, UCFC, UCRC). One specimen from San Diego is noted as "ex Black scale sample twigs", while a specimen from

Orange County was reared from the larva of a coniopterygid (both UCRC). *Aphycaspis* is closely related to *Homalotylus* and *Isodromus*, both of which are also known as parasitoids of predators, so this new host record is not surprising. A single specimen collected in October from Stanislaus County (RLZC), represents a second new species.

Aphycoides Mercet 1921 [New state record]

Hosts. Hemiptera: Coccidae

clavellatus (Dalman 1820: 355) (*Encyrtus*) [**New state record**] (CSCA)

Type. NHRS

Distribution. W (Amador)

Host/habitat. *Nemolecanium graniforme*, *Physokermes fasciatus*, *P. hemicryphus*, *P. jezoensis*, *P. piceae*, *P. sugonjaevi*

Remarks. A single specimen that appears to be near this genus was collected in Mendocino (UCDC).

Aphycus Mayr 1876 [New state record]

spp.

Remarks. *Aphycus immaculatus* Howard, the only described species previously reported from California (Noyes 2001), is now treated in the genus *Metaphycus*. However, specimens that appear to represent an undescribed species have been collected from Imperial (CSCA, UCDC), Riverside (UCRC) and Stanislaus (RLZC) counties.

Arrenophagus Aurivillius 1888 [New state record] (UCRC)

Host. Hemiptera: Diaspididae

chionaspidis Aurivillius 1888: 146 [**New state record**] (UCRC).

Type. NHRS

Distribution. W (Los Angeles)

Host/habitat. *Aulacaspis rosae*, *A. tegalensis*, *Chionaspis ramakrishnai*, *C. salicis*, *Chrysomphalus dictyospermi*, *Contigaspis* sp., *Diaspidiotus forbesi*, *D. perniciosus*, *Diaspis boisduvalii*, *D.* sp., *Dynaspidiotus britannicus*, *D. tsugae*, *Fiorinia externa*, *F. saprosmae*, *Furchadaspis zamiae*, *Lepidosaphes japonica*, *Lopholeucaspis japonica*, *Parlatoria ziziphi*, *Pinnaspis aspidistrae*, *P. dysoxyli*, *P. strachani*, *Pseudaulacaspis cockerelli*, *P. pentegona*, *Unaspis citri*

Remarks. Gowdey (1925) reported this species from the coccid *Parasaissetia nigra*, in Jamaica, but this is probably a misidentification.

Blastothrix Mayr 1876

Hosts. Hemiptera: Coccidae, Eriococcidae, Kermesidae

americana Sugonjaev 1983: 603

Type. USNM

Distribution. N (Alameda, Butte, Contra Costa, Marin, Monterey, Napa, San Francisco, San Joaquin, San Mateo)

Host/habitat. *Eulecanium cerasorum*, *Eulecanium* sp.; **NEW**: *E. excrescens* (EMEC)

Remarks. As Sugonjaev (1983:146) noted, discriminating species of *Blastothrix* is difficult, especially when dealing with limited numbers of specimens, so the identification of all the California specimens should be regarded as tentative.

sp. nr. *britannica* Girault 1917d: 8

Type. USNM

Distribution. E? (Alameda, Contra Costa, El Dorado, Humboldt, Lassen, Los Angeles, Mendocino, Napa, San Francisco, Tulare)

Host/habitat. *Parthenolecanium corni*

Remarks. *Blastothrix britannica* is a Palearctic species. A species imported from Europe and released and established in British Colombia in 1928–29 in a biocontrol program directed against *Eulecanium tiliae* was initially identified as *B. sericea*, later misidentified as *B. longipennis* Howard, and ultimately confirmed as *B. brittanica* (Sugonjaev 1983). Reports of *B. sericea* in northern California, previously ascribed to the southward spread of this species (Barlett 1978a: 63), may be referrable to *B. brittanica* or *B. americana*. Sugonjaev (1983) reported specimens from Berkeley as "*B.* sp. aff. *britannica*", but he noted the material was too scanty and differed from the **Type**. Specimens near to *B. britannica* collected from counties along virtually the entire coast of California (CAS, CSCA, RLZC, UCDC, UCRC) may be this same taxon.

hedqvisti Sugonjaev 1964: 386

Type. ZIN

Distribution. W (Alameda, Nevada, Ventura)

Host/habitat. *Eulecanium pubescens*, *Eulecanium* sp., *Parthenolecanium corni, P. fletcheri, P. pruinosum*, *P. quercifex*

Remarks. Sugonjaev (1983) recorded this species from California, undoubtedly based on specimens in the USNM. However, in this paper is a discrepancy in the relative lengths of the postmarginal and stigmal veins—the key states the former is shorter than the latter, but this appears not to be the case in his figure 3, nor in the original description (Sugonjaev 1964), so there may be some question if this species is truly present in the state. A specimen identified as "near *hedqvisti*" by Sugonjaev was reared from *Parthenolecanium corni* in Los Angeles County (UCRC).

longipennis Howard 1881: 366

Type. USNM

Distribution. W (Alameda, Calaveras, Contra Costa, Los Angeles, Mendocino, Monterey, Nevada, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Santa Clara, Santa Cruz, Sierra, Siskiyou, Solano, Sonoma, Ventura, Yolo, *Sierra Nevada*)

Host/habitat. *Eriococcus spurius, Eulecanium cerasorum*, *Nanokermes pubescens Parthenolecanium corni*, *P. fletcheri*, *P. pomeranicum*, *P. pruinosum*, *P. quercifex*, *P. rufulum*

Remarks. This species was initially identified by Compere as the parasitoid attacking *E. cerasorum* in Linden (San Joaquin County) (Michelbacher & Hitchcock 1957), but Sugonjaev (1983) has since described that parasitoid as *B. americana*. This suggests that any other pre-1983 report of *B. longipennis* from California (e.g. Timberlake's (1924:251) record from Berkeley (Alameda County) and Struble & Bedard's (1958) record from the Sierras) may also refer to *B. americana*. The latter paper also reports *Coleotechnites milleri* (Busck) (Lepidoptera: Gelechiidae) as a possible host, based on parasitoids emerging from foliage infested by the leaf miner, but it is far more likely that they instead issued from undetected scales. Another mistaken host record is *Eulecanium tiliae*, which was the result of a misidentification, and is properly attributable to *Blastothrix britannica* (Sugonjaev 1983: 142).

spp.

Remarks. There appears to be an undescribed species near *B. longipennis* from Alameda, Amador, Calaveras, Contra Costa, and Marin counties (CSCA, RLZC), and a second species from San Bernardino County (UCRC).

***Bothriothorax* Ratzeburg 1844**

Hosts. Diptera: Syrphidae

californicus Howard 1895a: 609

Type. USNM

Distribution. C (Alameda, Alpine, Contra Costa, Fresno, Humboldt, Lassen, Marin, Mendocino, Merced, Mono/Tuolumne border, Monterey, Nevada, Riverside, Sacramento, San Francisco, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Sierra, Solano, Sonoma, Tehama, Trinity, Yolo, *coastal southern California*)

Host/habitat. *Eupeodes nitens*, *Scaeva pyrastri*, *Syrphus opinator*

Remarks. Howard described *B. californicus* from three specimens, noting the "types" were in the U.S. National Museum, but I found only two specimens there. The Nearctic *Bothriothorax* species are badly in need of revision—the only generic treatment was by Howard (1895a) and there are discrepancies between the specimens and the descriptions therein. This species may prove to be a senior synonym of *B. faridi* and *B. rotundiformis* (*q.v.*).

faridi Kamal 1926: 283

Type. USNM

Distribution. C (Santa Clara)

Host/habitat. *Syrphus opinator*

Remarks. In the original description, Kamal did not provide a diagnosis for this species. It is very close to *B. californicus*, and the only difference I could discern between the types of the two species is a pair of medial longitudinal carina on the propodeum of *B. faridi* (missing in *B. californicus*). However, this is not a reliable defining characteristic, as an examination of a series of specimens from Merced County show it is present in some specimens and absent from others, so I suspect *B. faridi* will prove to be a junior synonym of *B. californicus*.

nigripes Howard 1895a: 610

Type. USNM

Distribution. N (Colusa, Contra Costa, Imperial, Inyo, Kern, Los Angeles, Marin, Mono, Monterey, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, San Mateo, Santa Barbara, Trinity, Tulare)

Host/habitat. *Eupeodes lapponicus*, *E. volucris*

Remarks. In the original description, Howard erroneously reported the first funicle segment was as long as the pedicel. There is a series of specimens of this species from Los Angeles County that were apparently reared from the pupa of a Lycaenidae (Lepidoptera) (EMEC). Interestingly, this is not the first record of a *Bothriothorax* associated with Lepidoptera—*B. altensteinii* Ratzeburg 1844 has been reported as a hyperparasitoid of *Lymantria dispar* (Linnaeus) (Lepidoptera: Lymantriidae) via *Exorista larvarum* (Linnaeus)(Diptera: Tachinidae) (Erdös 1957), and *B. paradoxus* (Dalman 1820) has been reported from *L. dispar*, as well as *Phalera bucephala* (Linnaeus) (Notodontidae), and as a hyperparasitoid of *Gastropacha quercifolia* (Linnaeus) (Lasiocampidae), via the tachinids *Compsilura concinnata* (Meigen), *E. larvarum* and *Sturmia scutellata* (Robineau-Desvoidy) (Gyorfi 1942). Although Noyes (2001) considers the *P. bucephala* record erroneous based on the discontinuity in the generic host range (predatory syrphids vs. parasitic tachinids), a similar dichotomy is present in the genus *Syrphophagus*, which are known as primary parasitoids of syrphids and hyperparasitoids of aphids.

rotundiformis Howard 1895a: 610

Type. USNM

Distribution. N (Placer)

Host/habitat. Unknown

Remarks. This species is known from only the single type specimen, which is very close to *B. californicus*. I am treating it as a good species, but further research may prove these two species to be synonymous.

spp.

Remarks. Specimens that appear to represent three additional species were collected in Alameda, Marin, Nevada, San Mateo and Santa Clara, Santa Cruz and Sonoma counties (CAS, EMEC, LACM, RLZC).

***Brethesiella* Porter 1920**

Hosts. Hemiptera: Margarodidae

mojave V. Trjapitzin & S. Triapitsyn 2006: 7
Type. UCRC
Distribution. C (Los Angeles)
Host/habitat. *Steatococcus tabernicolus*

***Caenohomalopoda* Tachikawa 1979 [New state record]**

Hosts. Hemiptera: Diaspididae

shikokuensis (Tachikawa 1956: 90) (*Pseudhomalopoda*) [**New state record**](USNM)
Type. EUMJ
Distribution. A (Orange) (USNM)
Host/habitat. *Froggattiella penicillata*
Remarks. Trjapitzin (1989) reported *Odonaspis secreta* as a host of this species in Korea,but it is unclear whether that host record is more properly ascribed to *C. koreana* Tachikawa, Paik & Paik 1981. This species is presumably native to eastern Asia, but has spread worldwide (it has been previously reported from Africa, the Caribbean and Florida) with the introduction of bamboo.

***Cerapterocerus* Westwood 1833 [New state record]**

spp.
Remarks. One described species (*C. phragmitis* Gordh & Trjapitzin 1981) and three undescribed species of this genus have been reported from the Nearctic region (Noyes *et al.* 1997). There are fully winged and brachypterous specimens, representing what appear to be two undescribed species, from Alpine, Inyo, Lassen, Mono, Modoc, Santa Clara, Stanislaus and Tuolumne counties (CSCA, RLZC, UCDC, UCFC, UCRC).

***Ceraptroceroideus* Girault 1916 [New state record]**

Hosts. Hemiptera: Diaspididae

cinctipes Girault 1916: 48 [**New state record**] (RLZC)
Type. USNM
Distribution. N (Marin)
Host/habitat. *Rhizaspidiotus dearnessi*
Remarks. The specimens from Marin are brachypterous, but the color pattern clearly matches that of the original description.

spp.
Remarks. There appear to be two undescribed species from Alpine, Imperial, Inyo, Kern, Lassen, Marin, Riverside, San Bernardino, San Luis Obispo and Santa Cruz counties (CSCA, OSU, RLZC, UCDC, UCRC).

***Cerchysiella* Girault 1914**

Hosts. Coleoptera: Nitidulidae

scutellata (Howard 1897: 156) (*Aratus*)

Type. BMNH

Distribution. U (Riverside)

Host/habitat. *Carpophilus hemipterus*, *Stelidota geminata*

Remarks. Except for a single record from Riverside (LaSalle & Gordh 1985), this species is known only from the West Indies and Brazil. As LaSalle & Gordh pointed out, it remains to be seen if the California record represents part of a broad distribution of the species, or the result of an adventitious introduction.

spp.

Remarks. Specimens undetermined to species were collected in Alameda, Marin, Orange, Sonoma and Stanislaus counties (CSCA, RLZC, UCFC).

Cerchysius Westwood 1832 [New state record]

Hosts. Diptera: Chamaemyiidae, Drosophilidae, Leucospidae

marilandicus Girault 1917e: 119 [**New state record**] (CAS, LACM, RLZC, UCDC)

Type. USNM

Distribution. N (Contra Costa, El Dorado, Lassen, Marin, Napa, Nevada, Plumas, Santa Clara, Sierra, Siskiyou, Solano, Stanislaus, Sutter, Tehama, Yolo)

Host/habitat. Unknown

Remarks. The name of the paper in which *C. marilandicus* was described was mistakenly recorded by Noyes (2001) as "Descriptions of miscellanous Chalcid-Flies from California", but in fact the last two words are not present in the title. Of the 12 described species in this genus, only three (*laticeps* Kerrich, *subplanus* (Dalman) and *ugandensis* Kerrich, all Palearctic taxa) have recorded hosts, all Diptera. However, there are two records in the literature of undescribed *Cerchysius* from Hemiptera: a *Cerchysius* species near *laticeps* was reared from a scale ("Coccid on wild plant") in India (Shafee *et al.* 1975) (and not *C. laticeps* itself on a Pseudococcidae, as reported in Noyes & Hayat 1994 and Noyes 2001), and an undescribed species was reported as a hyperparasitoid on *Coccus hesperidum* via *Microterys nietneri* (as *M. flavus*) in California, and associated with *Saissetia oleae* (Timberlake 1913). There is also a record of a *Cerchysius* sp. as a hyperparasitoid on *Coelomera lanio* Dalman, via *Lydellothelaira collaris* Townsend (Diptera: Tachinidae) (Parker *et al.* 1953).

spp.

Remarks. An apparently undescribed species is represented by a series of three specimens from Stanislaus County (UCFC).

Cheiloneurus Westwood 1833

Hosts. Hyperparasitoids of Coleoptera: Coccinellidae; Diptera: Cecidomyiidae, Syrphidae; Hemiptera: Aclerdidae, Cicadellidae, Coccidae, Delphacidae, Eriococcidae, Kermesidae, Pseudococcidae; Neuroptera: Chrysopidae; via Hymenoptera: Dryinidae, Encyrtidae, Ichneumonidae, Perilampidae, Platygastridae

albinotatus De Santis 1964: 351 [**New state record**] (RLZC)

Type. MLPA

Distribution. W (San Benito, Santa Barbara)

Host/habitat. Host unknown, but one specimen was swept from sedge (Cyperaceae), and a series of three specimens were swept from a grassy field.

Remarks. Previously this species has only been recorded from Argentina, but in addition to those from California, specimens have been collected in Arizona and North Carolina (both UCRC).

banksi (Howard 1898a: 247) (*Chrysopophagus*)

Type. USNM

Distribution. N (Alameda, Calaveras, Contra Costa, Imperial, Inyo, Kern, Kings, Lassen, Los Angeles, Madera, Marin, Modoc, Napa, Nevada, Plumas, Riverside, San Benito, San Bernardino, San Diego, Santa Barbara, Santa Clara, Shasta, Sierra, Solano, Sonoma, Stanislaus, Tehama, Tulare)

Host/habitat. Hyperparasitoid of *Antonina graminis*, *Eriococcus* sp. via *Pseudococcobius* sp.; **NEW**: *Phenacoccus* sp. (UCRC), *Dysmicoccus timberlakei*, hyperparasitoid of *Hyperaspis pleuralis* via *Homalotylus affinis* (EMEC)

Remarks. The specimen (EMEC) reared from *D. timberlakei* is probably a hyperparasitoid of an undescribed species of *Pseudleptomastix,* which was reared from the same host. This appears to be a species with a high variation in body color—ranging from coppery fuscous with yellow patches to almost totally dark, with the scutellum always at least partly yellow. A *Cheiloneurus* species near *banksi* was collected from Inyo County (UCDC), and there is another long series from Los Angeles and Riverside counties (UCRC).

compressicornis (Ashmead 1894: 246) (*Chrysopophagus*)

Type. USNM

Distribution. N (Los Angeles, Nevada, Orange, Riverside, San Bernardino, San Diego)

Host/habitat. Hyperparasitoid of undetermined Syrphidae, *Ceraeochrysa cubana*, *C. sanchezi*, *C. valida*, *Chrysopa nigricornis*, *Chrysoperla plorabunda*, *C. rufilabris*, via *Isodromus iceryae*, *I. niger*, *Gelis tenellus*, *Perilampus chrysopae*; **NEW**: *Chrysopa oculata*, undetermined Hemerobiidae (both UCRC).

Remarks. Two *Cheiloneurus* species near *compressicornis* were collected in Nevada & Sierra Counties (UCDC), another from Imperial County (UCRC), and two more specimens from Riverside County, which were reared from a whitefly on *Encelia* sp. (Asteraceae). *Chrysoperla carnea* (Stephens) has been recorded as a host in North America, but some authorities consider this species is restricted to the Palearctic, and would attribute such Nearctic host records to the *C. plorabunda* complex. The host record of a syrphid fly stems from a single observation by McGregor (1914)—it remains to be seen if this represents a misidentification, or if the secondary host range of *C. compressicornis* does indeed extend beyond the Neuroptera (there are no records of *I. iceryae*, *I. niger*, *G. tenellus* or *P. chrysopae* attacking any Diptera).

elegans (Dalman 1820: 151) [**New state record**](RLZC)

Type. NHRS

Distribution. W (Contra Costa, Marin, Stanislaus)

Host/habitat. Hyperparasitoid of *Mayetiola destructor* (via *Platygaster zosinae*), *Aclerda subterranea* (via *Paraphaenodiscus subterraneus*), *Eulecanium franconicum*, *Phenacoccus hordei, Physokermes piceae*, *Pulvinaria vitis*, *Trionymus abberans*

Remarks. In South America and the Old World, this species is recorded as a hyperparasitoid of Aclerdidae, Pseudococcidae and Coccidae, whereas in North America it is only known as a hyperparasitoid of Diptera, which suggests records of this species represents a complex of species or two biological races of one species (Ferriere 1952). Neunenschwander *et al.* (1987) reported *Cheiloneurus* ?*elegans* as a hyperparasitoid of *Phenacoccus manihoti* via *Anagyrus lopezi* in Africa, but this identification has apparently never been confirmed. *Eupelmus elegans* Dalman 1820, is a junior of *C. elegans* (Noyes 2001), which led Noyes (2001) to mistakenly record *Rhyacionia buoliana* as a host of this species, based on the report of Millan de De Santis & De Santis (1960). However, the host record in that paper referred to *Eupelmus elegans* Blanchard 1942.

flaccus (Walker 1847: 21) (*Encyrtus*)

Type. BMNH

Distribution. N (Alpine, Contra Costa, Inyo, Marin, Monterey, Sacramento, Sonoma, Stanislaus)

Host/habitat. Hyperparasitoid of undetermined Cicadellidae; *Megamelus proserpina* via *Echthrodelphax fairchildii*, *Haplogonatopus vitiensis*, *Pseudogonatopus hospes*

Remarks. This species was described from material collected in Ohio, and has become established in Hawaii.

inimicus Compere 1925: 297

Type. USNM

Distribution. W (Alameda, Amador, Butte, Calaveras, Contra Costa, El Dorado, Los Angeles, Riverside, San Benito, San Bernardino, San Luis Obispo, Santa Barbara, Santa Clara, Stanislaus, Solano, Tulare, Ventura)

Host/habitat. Hyperparasitoid of *Ceroplastes* sp., *Physokermes insignicola*, *Saissetia oleae* via *Metaphycus lounsburyi*, *M. physokermis*; **NEW**: *Amonostherium lichtensioides*, *Lecanodiaspis rufescens*, *Pulvinaria mesembryanthemi* via *Diversinervus elegans*, *Microterys nietneri* (all UCRC)

Remarks. Specimens of a *Cheiloneurus* species near *inimicus* were collected from Fresno and Tehama counties (EMEC), Marin County (RLZC) and San Bernardino County, the latter having emerged from a gall on a *Quercus* sp. (Fagaceae) (UCRC). McCoy & Selhime (1970) reported this species as a primary parasitoid of *S. oleae* based on the lack of host remains, but Rosen (1981) corrected this, pointing out that hyperparasitoids can consume their entire host.

lineascapus Gahan 1910: 207

Type. USNM

Distribution. N (Los Angeles, Napa, San Bernardino, San Diego, Ventura)

Host/habitat. Hyperparasitoid of *Kermes nigropunctatus, Saissetia oleae* via *Metaphycus lounsburyi***; NEW**: *Radiococcus kelloggii* (EMEC)

Remarks. The host record of a *Kermes* sp. on lilac (Oleaceae) given in the original description is probably a misidentification, since as far as is known, *Kermes* spp. are restricted to *Quercus* spp.

noxius Compere 1925: 302

Type. USNM

Distribution. C (Contra Costa, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Stanislaus)

Host/habitat. Hyperparasitoid of *Coccus hesperidum*, *Saissetia coffeae*, *S. oleae* via *Diversinervus elegans*, *Metaphycus lounsburyi*, *M. luteolus*, *M. stanleyi*, *Microterys nietneri*

Remarks. This species was accidentally established in Hawaii (Beardsley 1976). In nature, this species is probably restricted to *S. oleae/M. lounsburyi*—all other host records are from laboratory rearings. Weseloh (1969) reported this species appears to be able to discriminate between encyrtid and aphelinid primary parasitoids in the scale host.

spp.

Remarks. In addition to the species listed above, I have seen specimens that appear to represent an additional 10 morphospecies present in the state

Cirrhencyrtus Timberlake 1918

Hosts (Hemiptera: Pseudococcidae)

ehrhorni (Timberlake 1916: 564) (*Pseudococcobius*)

Type. USNM

Distribution. C (Alameda, Contra Costa, Los Angeles, Monterey, San Francisco, San Mateo, Santa Clara, Stanislaus, Ventura)

Host/habitat. *Dysmicoccus ryani*, *Spilococcus implicatus*, *S. sequoiae*

spp.

Remarks. Specimens that appear to represent an undescribed species were collected in Contra Costa County (RLZC).

Coccidencyrtus Ashmead 1900

Hosts. Hemiptera: Diaspididae

infuscatus Compere & Annecke 1961: 61
Type. USNM
Distribution. C (Riverside, Tulare)
Host/habitat. *Diaspidiotus juglansregiae*

ochraceipes Gahan 1927: 18
Type. USNM
Distribution. W (Alameda, Los Angeles, San Diego)
Host/habitat. *Diaspis boisduvalii*, *Diaspis bromeliae*, *Diaspis* sp.

Coccidoctonus Crawford 1912

Hosts. Hyperparasitoid of Hemiptera: Asterolecaniidae, Coccidae via Hymenoptera: Aphelinidae, Encyrtidae, Pteromalidae

dubius (Girault 1915a: 102) (*Rhopalencyrtoidea*)
Type. QM
Distribution. E (Los Angeles, Riverside, San Diego, San Francisco, Santa Barbara, Santa Clara, Stanislaus, Ventura)
Host/habitat. Hyperparasitoid of *Coccus hesperidum*, *C. viridis*, *Parasaissetia nigra*, *Russellaspis pustulans*, *Saissetia coffeae*, *S. oleae* via *Anicetus beneficus*; *Coccophagus ceroplastae*, *C. merceti*, *Encyrtus infelix*, *Metaphycus lounsburyi*, *M. varius*, *Microterys nietner*i, *Moranila californica*, *Scutellista caerulea*
Remarks. This species, referred to in the literature as *Quaylea whittieri* (Girault 1918), was imported from Australia in 1901 under the mistaken belief it was a primary parasitoid of *S. oleae*. One synonym (and *nomen nudum*) of *C. dubius* is *Hemencyrtus crawii* Craw. Girault has been mistakenly attributed as the author of this name, but it was Ashmead who devised the name (without description), which was first published in Craw's (1902) report. Essig (1926) considered this species to be the chief factor in reducing the efficiency of *S. caerulea* and *M. lounsburyi* attacking *S. oleae* in southern California. Bernal *et al.* (2001) reported this species on citrus from the southern San Joaquin Valley (Fresno, Kern and Tulare counties) without specifying exactly which county this species occurred in. They also reared this species from a batch of *Coccus pseudomagnoliarum*, noting that the exact host still needs to be confirmed.

Coelopencyrtus Timberlake 1919b
Hosts. Hymenoptera: Apidae, Colletidae

hylaeoleter Burks 1958a: 24
Type. USNM
Distribution. N (Alameda, Los Angeles, Santa Clara, Yolo)
Host/habitat. *Ceratina acantha*, *C. punctigena*, *C.* sp., *Hylaeus ellipticus*, *Hylaeus* sp.
Remarks. Daly *et al.* (1967) reported that the undetermined *Ceratina* species was either *C. acantha* or *C. nanula* Cockerell, but no adult bees were available for the specific identification.

spp.
Remarks. Specimens that may represent undescribed species were collected from Contra Costa (EMEC, RLZC), Los Angeles (LACM), Marin (RLZC), San Diego (CSCA), and Mono and Siskiyou (USNM) counties.

***Comperia* Gomes 1942**

Hosts. Blattodea: Blattellidae

merceti (Compere 1938: 317) (*Dicarnosis*)

Type. BMNH

Distribution. E (Alameda, Contra Costa, Riverside, Sacramento, San Diego, Stanislaus, Yolo)

Host/habitat. *Supella longipalpa*, *Supella supellectilium*

Remarks. This appears to be a tropical species that has become adventitiously established around the world. This species was imported into California using Hawaiian stock in a biocontrol programs against cockroaches in the late 1970s and was reported established (Slater *et al.* 1981). However, there is a single specimen from Contra Costa County (EMEC) collected in 1957, indicating the species was probably already present in the state. Gomes (1942) reported *Blattella germanica* as a host, but Roth and Willis (1960) noted that this was not based on rearing records. Lawson (1954) reported that *C. merceti* was unable to attack *Blatta orientalis* and *Periplaneta americana* ootheca, but a single specimen (UCRC) was reportedly reared from a *Periplaneta* sp.

***Comperiella* Howard 1906**

Hosts. Hemiptera: Diaspididae

bifasciata Howard 1906

Type. USNM

Distribution. E (Butte, Glenn, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Tulare, Ventura)

Host/habitat. *Aonidiella aurantii*, *A. citrina*, *A. eremocitri*, *A. inornata*, *A. orientalis*, *A. taxus*, *Aspidiotus cryptomeriae*, *A. destructor*, *A. nerii*, *Chrysomphalus aonidum*, *C. bifasciculatus*, *C. dictyospermi*, *C.* sp., *Diaspidiotus gigas*, *D. perniciosus*, *Diaspis echinocacti*, *Dynaspidiotus abietis*, *Hemiberlesia rapax*, *Morganella longispina*, *Pseudaulacaspis pentagona*

Remarks. This is an Oriental species imported into many countries during various biological control programs. It was released in California from 1906 through 1952 (primarily for control of *Aonidiella aurantii*); the earliest importations failed, but the species finally became established in California in the mid-1920s (Rosen & DeBach 1978). This species was also introduced into Hawaii for control of several species, including *Saissetia coffeae*, even though it has never been demonstrated that this species is acceptable host (Funasaki *et al.* 1988).

***Copidosoma* Ratzeburg 1844**

Hosts. Lepidoptera: Argyresthiidae, Blastobasidae, Coleophoridae, Gelechiidae, Geometridae, Hepialidae, Noctuidae, Notodontidae, Oecophoridae, Pyralidae, Tortricidae, Yponomeutidae

albipes (Westwood 1837b: 440) [**New state record**]

Type. OUNH

Distribution. W

Host/habitat. *Anacampsis innocuella*, *A. niveopulvella*, *A. populella*, *Choristoneura conflictana*, *Coleophora viburniella*, *Epinotia solandriana*, *Gelechia turpella*, *Holcocera modestella*, *Pseudosciaphila duplex*

Remarks. Zolnerowich (in litt.) reported specimens of *C. innocuellae* Barron from California, but did not note the exact locations. In 2005, Guerrieri & Noyes synonymized *C. innocuellae* under *C. albipes*, thus extending the latter's distribution range from Europe to the Holarctic.

bakeri (Howard 1898a: 238) (*Berecyntus*) [**New state record**] (UCRC)

Type. USNM

Distribution. W (El Dorado, Los Angeles, Orange, Sacramento, San Bernardino, Siskiyou, Sutter)

Host/habitat. *Agrotis orthogonia*, *A. venerabilis*, *Apamea devastator*, *Euxoa auxiliaris*, *E. detersa*, *E. flavicollis*, *E. intrita*, *E. lidia*, *E. messoria*, *E. ochrogaster*, *E. scandens*, *E. tristicula, E.* sp., *Feltia jaculifera*, *F. subgothica*, *F.* sp., *Lacinipolia renigera*, *Peridroma saucia*, *Rachiplusia nu*, *Trichoplusia ni*, *Xestia smithii*

Remarks. Specimens identified as "*C. bakeri*?" have been collected from Mono County (CSCA), and Kern and Riverside Counties, with *Agrotis ipsilon* noted as a host (UCRC). Peck (1963) reported *Pissodes strobi* (Coleoptera: Curculionidae) as a host, citing MacAloney in Taylor (1929) as the authority. However, MacAloney did not positively associate *C. bakeri* with *P. strobi*, he merely reported that the parasitoid was reared from pine leaders which were infested with the weevil—undoubtedly *C. bakeri* had emerged from an unseen lepidopteran which was also in the plant material.

bucculatricis (Howard 1892: 366) (*Pentacnemus*) [**New state record**] (USNM, UCDC)

Type. USNM

Distribution. N (San Diego, Trinity)

Host/habitat. *Argyresthia aureoargentella*, *A. freyella*, *A. libocedrella*, *A. thuiella*, *Coleophora ulmifoliella*, *Coleotechnites thujaella*

Remarks. Noyes (2001), citing Peck (1963), noted "Diptera (leaf miner)" as a host, but the original report upon which this record is based is in fact Proctor (1938), in which *C. bucculatricis* is reported from a leaf miner on arborvitae (Cupressaceae), without any indication as to the taxon of the leaf miner.

capsicum Burks 1967: 54 [**New state record**] (EMEC, RLZC)

Type. USNM

Distribution. W (Alameda, Contra Costa, Marin, Santa Barbara, Sonoma)

Host/habitat. *Gnorimoschema gudmanella*, *Phthorimaea operculella*, *Symmetrischema capsica*, *Diatraea* sp, *Lineodes* sp.

celaenae Howard 1885: 11 [**New state record**] (EMEC, LACM, USNM, UCDC, UCRC)

Type. USNM

Distribution. N (Alameda, Alpine, Calaveras, Contra Costa, El Dorado, Glenn, Inyo, Kern, Napa, Lake, Lassen, Los Angeles, Marin, Modoc, Monterey, Napa, Plumas, Riverside, San Benito, San Bernardino, San Diego, Santa Clara, Shasta, Sierra, Siskiyou, Solano, Tulare, Ventura)

Host/habitat. *Agrotis orthogonia*, *Eupsilia* spp., *Euxoa declarata*, *E. messoria*, *E. ochrogaster*, *E. perpolita*, *E. scolastica*, *E. tristicula*, *Feltia jaculifera*, *Lacinipolia renigera*, *Peridroma saucia*, *Polia purpurissata*, *Protolampra rufipectus*, *Rhynchagrotis cupida*, *Xestia mustelina*; **NEW**: *Agrotis ipsilon* (EMEC), *Agrotis* sp. (UCRC)

cervius (Walker 1846: 177) [**New state record**] (BMNH, CAS, ROM, UCDC, UCRC)

Type. BMNH

Distribution. W (Fresno, Kern, Marin, Orange, Placer, Riverside, San Bernardino, Solano, Sonoma, Tulare)

Host/habitat. *Cosmorhoe ocellata*, *Eupithecia abietaria*, *E. analoga*, *E. assimilata*, *E. centaureata*, *E. expallidata*, *E. gueneata*, *E. haworthiata*, *E. innotata*, *E. laricata*, *E. linariata*, *E. pimpinellata*, *E. pusillata*, *E. rosmarinata*, *E. simpliciata*, *E. succenturiata*, *E. tripunctaria*, *E.* ?*trisignaria*, *E. unedonata*, *E. vulgata*, *E.* spp., *Perizoma affinitata*, *P. bifasciatum*

Remarks. Guerrieri & Noyes (2005) note that host records of *Chloroclystis v-ata* (Lepidoptera: Geometridae) and *Cydia strobiliella* (Lepidoptera: Tortricidae) require confirmation.

deceptor Miller 1958: 58

Type. CNC

Distribution. N (Calaveras, Mariposa, Riverside, San Bernardino, Tulare, Tuolumne)

Host/habitat. *Acleris variana, Argyresthia aureoargentella, Battaristis vittella*, *Coleotechnites apicitripunctella*, *C. canusella*, *C. huntella*, *C. milleri*, *C. moreonella*, *C. piceaella*, *C. starki*, *C. thujaella*, *C.* spp., *Epinotia nanana*, *Exoteleia dodecella*, *E. nepheos*, *E. pinifoliella*, *Recurvaria* spp.

Remarks. Craighead (1950) reported *Recurvaria nanella* Denis & Schiffermüller (a Palearctic species) as a host of *C. deceptor*, but this undoubtedly was based on European records of *C. nanellae* Silvestri, the name by

which the American species was known until Miller (1958) separated the two taxa.

floridanum (Ashmead 1900: 365) (*Berecyntus*)

Type. USNM

Distribution. W (Alameda, Calaveras, Contra Costa, Fresno, Imperial, Kern, Lake, Lassen, Los Angeles, Marin, Merced, Nevada, Orange, Riverside, Sacramento, San Diego, San Joaquin, Santa Clara, Sierra, Solano, Stanislaus, Tulare)

Host/habitat. *Agrapha agnata*, *A. tarassota*, *Argyrogramma signatum*, *Autographa gamma*, *Chrysodeixis acuta*, *C. argentifera*, *C. chalcites*, *C. eriosoma*, *C.* sp., *Mamestra brassicae*, *Nebrarctia obliqua*, *Plusia* sp., *Polychrysia moneta*, *Pseudoplusia includens*, *Rachiplusia nu*, *Thysanoplusia orichalcea*, *T. intermixta*, *Trichoplusia ni*; **NEW:** *Autoplusia egena* (CSCA), *A. oliveacea* (LACM)

Remarks. This is a cosmopolitan species, very similar to *C. truncatellum*, and pre-1988 records of either species should not be taken at face value. Noyes (1988a) and Guerrieri & Noyes (2005) noted the characteristics useful for separating the two, and suggest that *C. floridanum* is probably host-specific on noctuids from the subfamily Plusiinae, and that records from non-plusiines may be attributable to *C. truncatellum*. Conversely, they note that the following host records of *C. truncatellum* are probably instead attributable to *C. floridanum*: *Autographa californica*, *A. egena*, *A. gamma*, *A.* sp., *Euchalcia modestoides*, *Lamprotes c-aureum*, *Plusia festucae*, *Rachiplusia ou*, *Syngrapha epigaea*. De Santis & Monetti (2008) reported *Peridroma saucia* as a host, but this is probably a misidentification. A short series (LACM) was labelled "*D. menippe*" (=*Danaus plexippus* Linnaeus, Nymphalidae), but this also may be a misidentification.

gelechiae Howard 1885: 10 [**New state record**] (RLZC)

Type. USNM

Distribution. N (Calaveras, Lassen, Marin, Modoc, San Mateo)

Host/habitat. *Coleotechnites atrupictella*, *Gnorimoschema gallaeasterella*, *G. gallaesolidaginis*, *G. gibsoniella*, *G. salinaris*, *G.* sp., *Epiblema scudderiana*

Remarks. De Santis (1979) reported this species from Peru, attacking *Tuta* (=*Gnorimoschema*) *absoluta* (Meyrick). Since all other records of this species are from North America, I believe this single South American record represents a different species.

howardi Zolnerowich & Zuparko 2011 (*Parapsilophrys*)

Type. USNM

Distribution. N (Lake, Lassen, Nevada, Placer, Sacramento, Stanislaus)

Host/habitat. *Acleris* sp., *Anacampsis niveopulvella*, *Apotomis* sp., *Archips* sp., *Gelechia lynceella*, *G.* sp., *Pandemis canadana*, *Recurvia* sp.

Remarks. This is a replacement name for *C. gelechiae* Howard 1898a, a junior homonym of *C. gelechiae* Howard 1885. Özdikmen (2011) subsequently proposed the replacement name *C. americanum* for this same species.

koehleri Blanchard 1940: 107

Type. MLPA

Distribution. E (Southern California)

Host/habitat. *Phthorimaea operculella*, *Scrobipalpa absoluta*, *Symmetrischema tangolias*

Remarks. The initial importations of *Copidosoma* stock from South America released in California for control of *P. operculella* were originally credited to this species. However, as Annecke & Mynhardt (1974) pointed out, these importations were actually of *C. desantisi* (which failed to establish). But in the 1960s, *C. koehleri* was imported from Argentina and did establish (Oatman 1978). *Cydia molesta* (Lepidoptera: Tortricidae) has been recorded as a host, but this is doubtful.

pyralidis (Ashmead 1888: 15) (*Encyrtus*)

Type. USNM

Distribution. E (San Bernardino, Sutter, Yolo, Yuba)

Host/habitat. *Anarsia lineatella*, *Dichomeris flavocostella*, *D. setosella*

Remarks. This species was described from Florida, and has been reported from throughout the eastern USA, as far west as Utah, as well from Europe (Peck 1963), although Guerrieri & Noyes (2005) suggest the European records refer to *C. varicorne* (*q.v.*). In 1932, specimens from the eastern USA were released in Yuba County, and subsequently recovered (Clausen 1956a). Specimens labelled as this species collected from San Bernardino County (UCRC) may in fact be descendants of the material imported from France, and therefore represent *C. varicorne*, which may prove to be the senior synonym of *C. pyralidis*.

truncatellum (Dalman 1820: 168)

Type. NHRS

Distribution. W (Fresno, Lassen, Monterey, Nevada, Orange, Santa Clara, Sierra, Solano)

Host/habitat. *Actinotia polyodon*, *Agrotis malefida*, *A.* sp., *Anomis erosa*, *Apamea monoglypha*, *A. sublustris*, *Catocala electa*, *Euxoa lidia*, *E. obelisca*, *E. temera*, *E.* sp., *Hadena luteago*, *Hepialus humuli*, *Mamestra brassicae*, *Mocis latipes*, *Notodonta ziczac*, *Spodoptera ornithogalli*, *S.* sp., *Xestia diatrapezium*

Remarks. This species has been commonly confused with *C. floridanum* (*q.v.*), and similarly has been erroneously associated with numerous hosts (see Guerrieri & Noyes 2005). Noyes (2001) listed this species as a "Biocontrol introduction" in California. However, the species was never purposely imported into the state although an attempt was made to propagate field-collected *C. truncatellum* and then release it back in the field (Clancy 1969).

vagum Howard 1885: 11 [**New state record**] [BMNH, CSCA, CNC, LACM, USNM]

Type. USNM

Distribution. N (Riverside, Shasta, Sonoma, Tulare)

Host/habitat. *Argyrotaenia quercifoliana*, *Aroga trialbamaculella*, *Filatima pseudacaciella*, *Gelechia* sp., *Hofmannophila pseudospretella;* **NEW** *Chionodes kubai* (CSCA)

varicorne (Nees 1834: 214) **[New state record]** (EMEC)

Type. OUNH

Distribution. E (Colusa, Orange, San Bernardino)

Host/habitat. *Acleris hippophaeana*, *Anarsia eleagnella*, *A. ephippias*, *A. lineatella*, *A. sagmatica*, *A. spartiella*, *A.* sp., *Compsolechia anisogramma*, *Cydia funebrana*, *C. molesta*, *C. pomonella*, *Cydia* sp., *Dichromeris eridantis*, *Eucosma* sp., *Gypsosoma minutana*, *Lobesia incultana*, *Tortrix viridana*

Remarks. In 1931 a biocontrol program was initiated against *Anarsia lineatella* using *Copidosoma pyralidis*, an important parasitoid of this species known from the eastern USA, and thought to occur in Europe as well. European specimens were easier to obtain, and so specimens from France were imported into the USA, released near Yuba City (Sutter County) and Chino (San Bernardino County), and subsequently recovered (Oatman 1978). However, Guerrieri & Noyes (2005) opined that the French populations were actually *C. varicorne*, and recovered specimens (EMEC) certainly key out to that species. In 1932, additional releases of domestically obtained *C. pyralidis* were made in Yuba County (and subsequently recovered as well), and so "true" *C. pyralidis* is present in California, although *C. pyralidis* may prove to be a junior synonym of *C. varicorne*.

spp.

Remarks. *Copidosoma filicorne* (Dalman 1820) is an Old World species that became established in eastern North America—a single specimen (UCDC) from Fresno County closely resembles this species, although it varies in several details. Additionally, at least 5 other undescribed species occur in California (Zolnerowich, in litt.).

Copidosomopsis Girault 1915a

Hosts. Lepidoptera: Pyralidae, Tortricidae

plethorica (Caltagirone 1966: 146) (*Pentalitomastix*)

Type. CAS

Distribution. E (Alameda, Butte, Fresno, Kern, Madera, Santa Clara)

Host/habitat. *Amyelois transitella*, *Apomyelois ceratoniae*, *Cydia caryana*

Remarks. This species was introduced into the San Joaquin Valley from the 1960s through the 1970s from Mexico (Meals & Caltagirone 1995). Although the initial importations probably failed (Clausen 1978c, as *Pentalitomastix* sp.), by 1979 this species had established in both the Sacramento and San Joaquin Valleys (Legner 1983).

tanytmemus Caltagirone 1985: 705

Type. CAS

Distribution. C (El Dorado, Los Angeles, Stanislaus)

Host/habitat. *Ephestia kuehniella*

Remarks. The holotype was originally deposited with the Division of Biological Control, University of California, Berkeley, but was transferred to the California Academy of Sciences in 1993 (Zuparko & Hamai 1994).

spp.

Remarks. Specimens that represent an undescribed species were collected in Marin and Modoc counties (RLZC).

Deilio Noyes & Woolley 1994

Hosts. Hemiptera: Margarodidae

xylococculi (Beardsley & Gordh 1988: 161) (*Parechthrodryinus*)

Type. USNM

Distribution. C (El Dorado, Mariposa, Napa, Placer, Riverside)

Host/habitat. *Xylococculus macrocarpae*

Discodes Förster 1856

Hosts. Hemiptera: Asterolecaniidae, Coccidae, Diaspididae, Eriococcidae, Pseudococcidae

arizonensis (Howard 1898a 248) (*Phaenodiscus*) [**New state record**](UCRC)

Type. USNM

Distribution. N (Imperial)

Host/habitat. Unknown

spp.

Remarks. Gordh (1979) reported an undescribed species of this genus from California and Washington that feeds on *Planchonia arabidis* Signoret. I have seen specimens that appear to represent seven morphospecies from Alpine, Butte, Contra Costa, Lake, Los Angeles, Marin, Riverside, Santa Clara, Solano, Sonoma, Stanislaus, Tehama, Tuolumne and Yolo counties (CSCA, EMEC, RLZC, UCDC, UCFC, UCRC, USNM).

Diversinervus Silvestri 1915

Hosts. Hemiptera: Coccidae

elegans Silvestri 1915: 304

Type. DEZA

Distribution. E (Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Ventura)

Host/habitat. *Ceroplastes brevicauda*, *C. destructor*, *C. floridensis*, *C. rusci*, *C.* sp., *Coccus hesperidum*, *C. pseudomagnoliarum*, *Drepanococcus chiton*, *Eulecanium kunoense*, *Gascardia* sp., *Inglisia* sp., *Marsipococcus*

proteae, *Parasaissetia nigra*, *Parthenolecanium corni*, *Pulvinaria floccifera*, *P. psidii*, *P. urbicola*, *Saissetia coffeae*, *S. oleae*, *S. persimilis*, *S.* sp.

Remarks. The first effort to import this species (in a *Saissetia oleae* biocontrol program) into California was in 1931, but the stock perished in transit (Compere 1931). Successive importations (from Eritrea in 1953 and Lebanon in the mid-1960s) proved more successful, and it was released throughout the state (Lampson & Morse 1992). Initially, this species was recovered wherever *S. oleae* occurred in southern California (Bartlett & Medved 1966), but later studies found it only established in the coastal region of southern California (Kennett 1986; Lampson & Morse 1992), possibly as a result of being outcompeted by other imported natural enemies. Lampson and Morse (1992) suggested that *D. elegans* can act as a hyperparasitoid, but the detailed studies of Bartlett & Medved (1966) found no evidence of such (although second instar larvae will engage in combat to reduce the number of supernumeraries). Specimens from UCRC are recorded from *Aonidiella aurantii*, but I suspect these are misidentified.

Echthroplexiella Mercet 1921

spp.

Remarks. Until recently, this genus was known only from the Palearctic region, but Trjapitzin (2006) described a new species from Mexico, and reported another undescribed species from Pt. Reyes, Marin County (EMEC) (the collecting labels read "North Beach Turnoff, ungrazed plot", not "North Beach Tarnhoff, ungra-zed plot" as reported by Trjapitzin). Additional specimens of this species were collected in Lassen, Marin, Nevada, Santa Barbara (RLZC) and San Bernardino (UCRC) counties. Specimens which appear to represent a second species were collected in Inyo County (UCRC).

Echthroplexis Förster 1856

Hosts. Neuroptera: Hemerobiidae

planiformis (Howard 1895a: 611) (*Bothriothorax*)

Type. USNM

Distribution. N (Alameda, Alpine, Contra Costa, Kern, Los Angeles, Marin, Placer, Orange, Riverside, San Bernardino, San Joaquin, San Mateo, Santa Barbara, Shasta, Siskiyou, Solano, Stanislaus, Tulare)

Host/habitat. *Hemerobius pacificus*

Remarks. There is a host record of a ?*Sympherobius* species (UCRC).

Encyrtus Latreille 1809

Hosts. Hemiptera: Coccidae, Diaspididae, Eriococcidae, Pseudococcidae

aurantii (Geoffroy 1785: 386) (*Cynips*)

Type. Probably lost, but possibly in MNHN (J. Noyes, pers. comm.)

Distribution. W (Contra Costa, Los Angeles, Tulare, *southern San Joaquin Valley*, *southern California*)

Host/habitat. *Coccus hesperidum*, *C. pseudomagnoliarum*, *C. viridis*, *Diaspis boisduvalii*, *Eriococcus buxi*, *Eucalymnatus tessellatus*, *Eulecanium tiliae*, *Eulecanium* sp., *Parasaissetia nigra*, *Parthenolecanium corni*, *P. fletcheri*, *Planococcus citri*, *Pseudococcus longispinus*, *Pulvinaria floccifera*, *P. psidii*, *P.* sp., *Saissetia coffeae*, *S. oleae*, *S. privigna*, *Sphaerolecanium prunastri*

Remarks. In two recent studies, this species was reported (as *E. lecaniorum*) on citrus from the southern San Joaquin Valley (including Fresno, Kern & Tulare counties) and from a region further south (Riverside, San Bernardino and San Diego counties), but the exact counties it occurred in were not specified (Bernal *et al.* 2001; Kapranas *et al.* 2007). The former paper mistakenly claimed the host record of *Coccus pseudomagnoliarum* as new, but this association had been earlier reported by Trjapitzin (1957).

fuscus (Howard 1881: 363) (*Comys*)

Type. USNM

Distribution. N (Alameda, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Kern, Kings, Los Angeles, Marin, Mariposa, Modoc, Monterey, Napa, Nevada, Orange, Plumas, Riverside, San Benito, San Bernardino, San Luis Obispo, Santa Barbara, Santa Clara, Shasta, Sierra, Solano, Sonoma, Stanislaus, Tehama, Ventura, Yolo)

Host/habitat. *Eulecanium cerasorum, E. tiliae*, *Eulecanium* sp., *Mesolecanium nigrofasciatum*, *Parthenolecanium cerasifex*, *Parthenolecanium corni, Parthenolecanium persicae, P. pruinosum, P. quercifex, Pulvinaria vitis, Saissetia coffeae*, *S.* sp.

Remarks. Specimens in the CSCA were reared from a "*Lecanium*" species.

infelix (Embleton 1902: 223) (*Comys*)

Type. CUMZ

Distribution. E (Alameda, Colusa, Orange, San Diego, Tulare, Tuolumne, Ventura, Yolo)

Host/habitat. *Ceroplastes madagascariensis*, *Coccus hesperidum*, *Parasaissetia nigra*, *Protopulvinaria pyriformis*, *Pulvinaria urbicola*, *Saissetia coffeae*, *S. oleae*

Remarks. Imported from Hawaii in 1921 in an *S. oleae* biocontrol program, this species was reported established in California (Bartlett 1978a). It was not recovered in later surveys of *S. oleae* parasitoids (Kennett 1986; Daane *et al.* 1991; Lampson & Morse 1992), but was collected once in northern California in 1994 (RLZC).

saliens Prinsloo & Annecke 1978: 329

Type. PPRI

Distribution. E (?)

Host/habitat. *Pulvinaria delottoi*, *Pulvinariella mesembryanthemi, P.* sp.

Remarks. Introduced into California from South Africa in the early 1980s in a biocontrol program against *P. mesembryanthemi* and *P. delottoi*, this species, along with *Metaphycus funicularis* and *M. stramineus*, established immediately and are credited with the successful control of those species (Tassan & Hagen 1995), although I have been unable to determine the exact collection localities.

Epitetracnemus Girault 1915a [New state record]

Hosts. Hemiptera: Asterolecaniidae, Coccidae, Diaspididae

intersectus (Fonscolombe 1832: 305) (*Encyrtus*) [**New state record**] (EMEC, RLZC)

Type. Lost

Distribution. W (Alameda, Contra Costa, Yuba)

Host/habitat. *Asterodiaspis* mina, *A. quercicola*, *Asterolecanium* sp., *Ceroplastes rubens*, *Diaspidiotus bavaricus*, *D. gigas*, *D. macroporanus*, *D. ostreaeformis*, *D. perniciosus*, *D. prunorum*, *D. pyri*, *Lepidoasphes tubulorum*, *L. ulmi*, *L.* sp., *Parthenolecanium rufulum*, *Pseudaonidia duplex*, *P. paeoniae*, *Pseudaulacaspis pentagona*, *Sphaerolecanium prunastri*

Remarks. De Santis (1989) reported *Carulaspis minima* (Signoret) as a host from Bermuda, while Noyes (2001) reported both *C. minima* and *Lepidoasphes newsteadi* (Šulc*)* as hosts. These records appear to be erroneous, traceable to the biocontrol program directed against these two pests in Bermuda (Bennett & Hughes 1959). Although *E. intersectus* was exported from Italy as part of this program, I could find no primary records indicating that this species was successfully reared from either host.

Eusemion Dahlbom 1857

Hosts. Hyperparasitoids of Hemiptera: Coccidae via Hymenoptera: Encyrtidae

longipenne (Ashmead 1888: 17) (*Mira*)

Type. USNM

Distribution. N (Contra Costa, Marin, San Mateo, Santa Barbara, Sonoma, Tehama)

Host/habitat. Hyperparasitoid of *Coccus hesperidum*, *Eulecanium* sp. via *Metaphycus flavus* and *Microterys nietneri*; **NEW**: *Saissetia coffeae* (UCRC)

Remarks. Gordh (1979) listed this species as *E. longipennis*. It is a Nearctic taxon, although Peck (1963) opined it might be a synonym of *E. cornigerum* (Walker 1838) (a Palearctic species), thus resulting in a Holarctic distribution for the species. Annecke (1967) accepted this synonymy (without formalizing it), but other authors have not, and treat them as two separate species. A series of specimens (UCRC) is recorded from "*Aphycus* sp. in *Coccus hesperidum*", but the host is undoubtedly a *Metaphycus* species.

Exoristobia Ashmead 1904

spp.

Remarks. An undetermined species, recorded from "*Xylococcus*" has been collected from Riverside County, as well as a second specimen questionably from this genus (UCRC). Gordh (1979) reported an undescribed species (with a Girault manuscript name) of this genus from California under *Parasyrpophagus*.

Forcipestricis Burks 1968 [New state record] (CSCA, RLZC)

Hosts. Diptera: Ceratopogonidae

spp.

Remarks. Specimens that appear to represent an undescribed species near to *gazeaui* Burks, 1968 were collected in Contra Costa (RLZC) and Lake (CSCA) counties.

Formicencyrtus Girault 1916

Hosts. Hemiptera: Dactylopiidae, Pseudococcidae

neomexicanus (Ashmead 1900: 355) (*Anusia*)

Type. USNM

Distribution. N (Riverside)

Host/habitat. *Amonostherium lichtensioides*

Remarks. A specimen from Riverside (UCRC) is recorded as "on *Erium* n. sp.", a monotypic genus that is restricted to Australia, so this host record probably refers to an undetermined pseudococcid.

thoreauini Girault 1916: 45 [**New state record**] (UCDC)

Type. USNM

Distribution. N (Inyo)

Host/habitat. *Dactylopius confusus*

Remarks. Both of the named species of this genus were described from brachypterous specimens. Fully winged specimens were collected in Imperial County (UCDC) and Los Angeles and San Bernardino counties (UCRC), but it is not clear if they represent new species.

Gahaniella Timberlake 1926

Hosts. Primary or hyperparasitoid of Hemiptera: Asterolecaniidae, Coccidae, Ortheziidae, Pseudococcidae

californica Timberlake 1926: 26

Type. USNM

Distribution. W (Contra Costa, Los Angeles, Riverside, San Benito, San Diego, Stanislaus)

Host/habitat. *Alichtensia argentina*, *Coccus hesperidum*, *Eulecanium perinflatum*, *Parthenolecanium corni, Saissetia coffeae*, possibly as a hyperparasitoid

Remarks. Although Timberlake (1926) reared this species from *P. corni*, no definitive biological studies of this species have been conducted. One congener, *G. tertia*, is a hyperparasitoid of *Planococcus citri* via *Leptomastix dactylopii* (Kerrich 1953), and a second, *G. saissetiae* Timberlake, 1926, has been recorded from several families of scales (Noyes 2001) and is suspected of being hyperparasitic on *Saissetia oleae* (Compere 1939c), although Trjapitzin (2010) considered the entire genus was hyperparasitic. De Santis (1989) reported the host of *G. californica* as "Cochinilla blanda": Noyes (2001) treated this host as a pseudococcid, but it is a common name for *C. hesperidum* (see De Santis & Monetti 2008: 97).

Ginsiana Erdös & Novicky 1955

Hosts. Hemiptera: Aphalaridae

arbuticola (Gahan & Waterston 1926: 373) (*Psyllaephagus*)

Type. USNM

Distribution. C (Alameda, Amador, Marin, Napa, San Mateo, Santa Clara, Solano)

Host/habitat. *Neophyllura arbuti*

spp.

Remarks. Specimens that appear to represent three undescribed species of this genus have been collected in Alpine, El Dorado, Fresno, Inyo, Lake, Lassen, Los Angeles, Modoc, Mono, Napa, Nevada, Riverside, San Bernardino, Santa Barbara, Shasta, Sierra, Sonoma, Stanislaus and Tuolumne counties (CAS, CSCA, EMEC, RLZC, UCDC, UCFC, UCRC).

Habrolepis Förster 1856

Hosts. Hemiptera: Diaspididae

rouxi Compere 1936a: 495

Type. BMNH

Distribution. E (San Diego)

Host/habitat. *Aonidiella aurantii*, *A. citrina*, *A. orientalis*, *A.* sp., *Aspidiotus nerii, A.* sp., *Chrysomphalus aonidum*, *C.* sp., *Hemiberlesia rapax*, *Parlatoria oleae*, *Selenaspidus articulatus*

Remarks. First imported from South Africa and released against *Aonidiella aurantii* in southern California and Fresno in the late 1930s, this species proved to be ineffective, as the report of its establishment in California is based on the 1943 recovery from a single orchard in San Diego (Flanders 1944). This species was reimported from South Africa against *Parlatoria oleae* and released in Fresno County from 1940–42; although it reproduced on this species, it failed to establish in the field (Huffaker *et al.* 1962). In the 1970s it was imported from Saudi Arabia and cultured in quarantine (DeBach 1977), but I found no record of subsequent releases. Thus, it is quite possible that this species is no longer extant in the state. DeSantis (1979) reported *Carulaspis minima* (Signoret) as a host, but it is not clear what this is based on—Bennett & Hughes (1959) had previously reported that *H. rouxi* had been moved from California to Bermuda in a biocontrol program directed against that species, but there was no evidence actually citing *C. minima* as a suitable host. Blumberg & DeBach (1979) noted that *H. rouxi* would attack *Aspidiotus nerii* in the lab, but it wasn't a completely suitable host. Noyes (2001), citing Flanders (1944), recorded *Neoselenaspidus silvaticus* (Lindinger) as a host, but the earlier paper only noted that this scale species was heavily parasitized without identifying the parasitoid.

spp.

Remarks. What appears to be an undescribed species has been collected from a pit scale on a *Quercus* sp. in Marin (EMEC), as well as on *Adenostoma fasciculatum*, *Cercocarpus betuloides* (Rosaceae), *Pinus sabiniana* (Pinaceae), *Quercus agrifolia*, *Q. douglasii*, *Salix* ?*lasiolepis* (Salicaceae), and *Umbellularia californica* (Lauraceae) in Alameda, Contra Costa, Humboldt, Stanislaus, Sutter and Tuolumne counties (CAS, RLZC, UCDC, UCFC).

Helegonatopus Perkins 1906 [New state record]

Hosts. Hyperparasitoid of Hemiptera: Cicadellidae, Delphacidae via Hymenoptera: Dryinidae

spp.

Remarks. Two male specimens that appear referrable to this genus were collected in Placer (UCRC) and Stanislaus (UCFC) counties.

Hexacnemus Timberlake 1926

Hosts. Neuroptera: Hemerobiidae

armitagei Timberlake 1926: 15

Type. USNM

Distribution. N (Lake, Ventura)

Host/habitat. *Sympherobius californicus*, *S.* sp.

Remarks. Gordh (1979) noted that *H. armitagei* has also been reported to parasitize mealybugs on citrus, probably based on a specimen from Florida (USNM) that has "Mealybug, citrus" on the collecting label. *Sympherobius* is predacious on mealybugs, and I suspect this is a mistaken host record, and the true host was an unrecognized hemerobiid. Noyes (2001) reported that a record of the genus from South America (where it putatively attacked *Aleurothrixus floccosus* and *Planococcus citri*) was in error. In fact, Parker *et al.* (1953) reported an Argentinean *Hexacnemus* sp. "ex material" of these two species, noting that the parasites were reared "in grosso modo" from lots of material, and that the precise role of the parasite is not available. I have seen a male specimen (USNM) of this parasitoid from Argentina, and it is definitely a *Hexacnemus* species, although I am unable to determine if it is conspecific with *H. armitagei*. Additionally, the USNM has a female and male *Hexacnemus* sp., reared in association with nymphs of *Phenacoccus gossypii*, apparently from Columbia (CIAT-Palmira), that appear to represent an undescribed species of this genus.

Homalotyloidea Mercet 1921 [New state record]

Hosts. Hyperparasitoids of Coleoptera: Coccinellidae, Discolomatidae via Hymenoptera: Encyrtidae

spp.

Remarks. A single specimen of an undetermined species was collected in Riverside County (UCRC).

Homalotylus Mayr 1876

Hosts. Coleoptera: Coccinellidae

affinis Timberlake 1919c: 165

Type. USNM

Distribution. C (Kings, San Bernardino)
Host/habitat. *Hyperaspis osculans*; **NEW**: *Hyperaspis pleuralis* (EMEC)

hyperaspidis Timberlake 1919c: 167
Type. USNM
Distribution. N (Alameda, Los Angeles, Marin)
Host/habitat. *Hyperaspis undulata*, *H.* sp.

similis Ashmead 1887: 190
Type. USNM
Distribution. N (Alameda, Riverside, San Mateo)
Host/habitat. *Hyperaspis bigeminata*, *Scymnus americanus*, *S. cervicalis*, *S. iowensis*, *S. lacustris, S.* sp.

terminalis (Say 1828: 80) (*Serlion*)
Type. USNM
Distribution. W (Alameda, Kern, Los Angeles, Marin, Orange, Riverside, San Bernardino, San Diego, San Mateo, Santa Clara)
Host/habitat. *Adalia bipunctata*, *Anatis labiculata*, *Cheilomenes sexmaculatus*, *Chilocorus similis*, *Coccinella californica, C. novemnotata, C. quinquenotata*, *C. quinquepunctata*, *Coccinella transversoguttata*, *Coleomegilla innotata, C. maculata*, *C.* sp., *Cycloneda sanguinea*, *C.* sp., *Disonycha* sp., *Hippodamia convergens, Myzia pullata, Psyllobora vigintimaculata, Scymnus* sp.
Remarks. Host records of the aphids *Hysteroneura setariae* (Thomas) and *Sipha flava* (Forbes) appearing in Noyes (2001) are incorrect—in the original papers, these species are noted as prey of the coccinellids attacked by *H. terminalis*.

Isodromus Howard 1887

Hosts. Neuroptera: Chrysopidae, Hemerobiidae

iceryae Howard 1887: 488
Type. USNM
Distribution. W (Alameda, Contra Costa, Los Angeles, Marin, Napa, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Clara, Sonoma, Ventura)
Host/habitat. *Ceraeochrysa cubana, C. lateralis, C. sanchezi*, *C. valida*, *Chrysoperla ploribunda*, *C. rufilabris*, *Leucochrysa floridana*, *Sympherobius angustus, Sympherobius californicus*; **NEW**: *Chrysopa nigricornis* (EMEC)
Remarks. *Icerya purchasi* and *Saissetia oleae* were erroneously reported as hosts by several authors—these reports are attributable to parasitized *Chrysopa* larvae, which pupated within the hollow shell of a dead scale (Clancy 1946a). Similarly, I consider the host report of *Coccus hesperidum* (De Santis & Monetti 2008) to be in error. Clancy (1946a) also questioned the validity of hemerobiid host records, but noted that *I. iceryae* would reproduce on *Eremochrysa punctinervis* in the lab. A series of specimens was reared from galls of *Heteroecus dasydactyli* (Ashmead) (Hymenoptera: Cynipidae) in San Bernardino County (UCRC). *Harrisina brillans* (Lepidoptera: Zygaenidae) is noted as the host for one specimen (UCRC), but this is undoubtedly erroneous.

niger Ashmead 1900: 379
Type. USNM
Distribution. W (Alameda, Los Angeles, Santa Clara, Solano, Ventura)
Host/habitat. *Chrysopa nigricornis, C. oculata, C. pallens, C.* sp., *Chrysoperla carnea, Sympherobius angustus,* Hemerobiidae sp.
Remarks. Clancy (1946a) considered the only valid host records for this species were for the two closely related species, *Chrysopa nigricorns* (= *C. majuscula*) and *C. oculata*. Host records for *Chilocorus similis* and

Lymantria dispar (Linnaeus) are clearly erroneous, while records for "*Chrysopa*" may equally refer to *Chrysoperla*.

puncticeps (Howard 1885: 14) (*Encyrtus*)

Type. USNM

Distribution. W (Stanislaus, Yolo)

Host/habitat. *Chrysopa* sp.

spp.

Remarks. A specimen determined as "sp. nr. *axillaris*" (Timberlake 1919c), was recorded from *Chrysopa nigricornis* in Contra Costa County (EMEC), and what appear to be undescribed species near *atriventris* (Ashmead 1900) were collected on aphid-infested *Pinus sabiniana* in Calaveras County and *Liriodendron tulipifera* (Magnoliaceae) in Stanislaus County (both RLZC).

Ixodiphagus Howard 1907

Hosts. Acari: Ixodidae

hookeri (Howard 1908: 241) (*Hunterellus*)

Type. USNM

Distribution. W (Los Angeles, Marin, Stanislaus)

Host/habitat. *Amblyomma tholloni, A. variegatum*, *Dermacentor andersoni, D. nitens*, *D. parumapertus, D. variabilis, D.* sp., *Haemaphysalis bispinosa. H. concinna, H. inermis, H. japonica, H. leachei, H. leporispalustris, H. punctata, Hyalomma aegyptum, H. anatolicum, H. asiaticum, H.* sp., *Ixodes crenulatus, I. dentatus, I. hexagonus, I. marmotae, I. muris, I. persulcatus, I. ricinus, I. scapularis, I. texanus, I.* sp., *Rhipicephalus appendiculatus, R. evertsi, R. oculatus, R. sanguineus, R.* sp.

Remarks. The host record of "*Ixodes hucinus*" in Noyes 2001 is a misprint for *I. ricinus*.

Lamennaisia Girault 1922

Hosts. Coleoptera: Chrysomelidae, Lathridiidae, Orthoperidae; Lepidoptera: Notodontidae

ambigua (Nees 1834: 239) (*Encyrtus*)

Type. Probably destroyed (Noyes 1988b)

Distribution. W (Alameda, Alpine, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Humboldt, Inyo, Kern, Lassen, Los Angeles, Marin, Modoc, Mono, Monterey, Napa, Nevada, Orange, Placer, Plumas, Riverside. Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Tehama, Trinity, Tuolumne and Yolo)

Host/habitat. *Bruchus brachialis*, *Melanophthalma* sp.; **NEW**: Orthoperidae (UCDC), *Phryganidia californica* (CAS)

Remarks. *Lamennaisia ambigua* is a cosmopolitan species. This is the encyrtid I have most commonly collected in the state; it is especially abundant in grassy areas, but I have also collected it on trees, woody shrubs and *Equisetum* (Equisetaceae) species. It is also one of the few encyrtid species that is active throughout the year in California. Besides the hosts recorded above, *L. ambigua* has also been reared from *Medicago sativa* (Fabaceae) infested with *Bruchophagus roddi* Gussakovskiy (Hymenoptera: Eurytomidae) (Noyes 1988b). Such a wide range in host taxa is unusual for an encyrtid, and suggests this species may be hyperparasitic. This species was recorded (as *Encyrtus dubius*) as a parasitoid of *Icerya purchasi* based on a single specimen that issued from "…a box which contained only adult females of the scale." (Howard 1889). This record should be regarded as unproven, since alternative hosts might have been present as well.

spp.

Remarks. Specimens from an undescribed species were collected in Imperial, Orange and Riverside counties (UCDC, UCRC).

Mahencyrtus Masi 1917 [New state record]

spp.

Remarks. Undetermined specimens of this genus were collected in Marin (RLZC), Riverside (UCRC), and Sacramento (EMEC) counties.

Mayridia Mercet, 1921 [New state record]

spp.

Remarks. Specimens of this genus that appear to represent three undescribed species were collected in Alameda, Contra Costa, Inyo, Lassen, Marin, Nevada, Riverside, San Bernardino, San Diego, Santa Barbara, Sierra, Solano, Sonoma, Tehama and Tuolumne counties (EMEC, RLZC, SBMN, UCDC, UCRC).

Merlen Noyes & Woolley 1994 [New state record]

spp.

Remarks. A short series of an undetermined species was collected in Stanislaus County, as well as a single male in Modoc county (RLZC).

Meromyzobia Ashmead 1900

deserticola Gordh 1987: 24

Type. USNM

Distribution. C (El Centro)

Host/habitat. Collected on *Pleuraphis rigida* (Thurber) (Poaceae)

Remarks. Gordh (1987) notes that species from this genus have an ecological preference for grasses. According to Noyes (2001), confirmed *Meromyzobia* host records (all extralimital) include Orthoptera eggs, Diptera (Chloropidae and Drosophilidae) and hyperparasitic on Aclerdidae via Chamaemyiidae; one species has also been associated with Pseudococcidae.

spp.

Remarks. Specimens that appear to represent 4 undescribed species have been collected from Imperial, Inyo, Lassen, Solano and Stanislaus counties (CSCA, RLZC, UCDC, UCRC).

Metablastothrix Sugonjaev 1964

Hosts. Hemiptera: Coccidae

claripennis (Compere 1928: 216) (*Microterys*)

Type. USNM

Distribution. N (Alameda, Contra Costa, El Dorado, Kern, Lassen, Los Angeles, Modoc, Monterey, Napa, Riverside, San Bernardino, San Luis Obispo, Santa Clara, Shasta, Stanislaus, Yolo)

Host/habitat. *Eulecanium tiliae*, *Parthenolecanium corni, P. fletcheri, P. quercifex*

Remarks. This species has a Nearctic distribution, and is only reliably recorded from Coccidae (Noyes 2001). There is a single record of it from Brazil (de Santis 1980: 195), which appears to be based on an earlier Brazilian catalog by Araújo e Silva *et al.* (1968). However, in the earlier work *M. claripennis* was not recorded from Brazil—under Encyrtidae (pp. 599–600) they list only 5 described species, three of which are now placed under Tanaostigmatidae. Instead this species is simply cited (page 100, as *Microterys claripennis*) as a parasitoid of *Aetalion reticulatum* (Linnaeus) (Hemiptera: Aetalionidae). In my opinion, this is a dubious host record (no other encyrtids have been recorded parasitizing this family, and only *Prionomastix* has been recorded as attacking the closely related Membracidae). Sugonjaev & Trjapitzin (1988) opine that *M. claripennis* is actually a secondary parasitoid via *Encyrtus fuscus*, based on two lines of thought. The first is the incidence of hyperparasitism in closely related species, including the congeneric *M. truncatipennis* (Ferrière); however, the latter species has since been placed in the genus *Blastothrix*. The second is Compere's unpublished notes from 1911–1912, although they note that Compere (1928) later stated nothing was known of the status (i.e.: a primary or secondary parasitoid) of *M. claripennis*. Thus its status remains unknown. Undetermined specimens of this genus have also been collected from Lassen, Marin and Yolo counties (CSCA, EMEC).

Metanotalia Mercet 1921

Hosts. Hemiptera: Pseudococcidae

maderensis (Walker 1872: 116) (*Ectroma*)

Type. BMNH

Distribution. A (Alameda, Amador, Contra Costa, Glenn, Marin, Mendocino, Modoc, Napa, Orange, Riverside, San Diego, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tulare)

Host/habitat. *Antonina purpurea*, *Phenacoccus madeirensis*

Remarks. Despite its small size, this is an easily recognized species, and since the mid 1990s, I have often swept it from grass in many areas throughout the state. However, the first published record of this species from California wasn't until 1988 (Noyes 1988b), and the earliest record I found from the state was from Orange County (UCRC) in 1983, suggesting it is a relatively recent introduction. The species is probably Palearctic in origin, and now occurs in New Zealand as well as throughout the Holarctic region (Noyes 2001). It may have been unintentionally introduced into southern California in a shipment of parasitized mealybugs from Taiwan in 1951 (Zuparko 1995a).

Metaphycus Mercet 1917

Hosts. Hemiptera: Coccidae, Diaspididae, Eriococcidae, Kermesidae, Pseudococcidae, Triozidae

alberti (Howard 1898a: 247) (*Aphycus*)

Type. USNM

Distribution. W (Los Angeles, Riverside, San Diego, Santa Barbara)

Host/habitat. *Ceroplastes* sp., *Coccus hesperidum*, *Parthenolecanium persicae*

Remarks. Originally described from Australia, this species has also been recorded from Hawaii and South Africa. Stauffer & Rose (1997) reported this species from Riverside county on *C. hesperidum*, while Bernal *et al.* (2001) reported it on citrus from the southern San Joaquin Valley (Fresno, Kern and Tulare counties) without specifying exactly which county it occurred in. They also reared this species from a batch of *Coccus pseudomagnoliarum*, noting that the exact host still needs to be confirmed. Kapranas *et al.* (2007) failed to find this species in their survey of *Coccus hesperidum* in southern California citrus. A single specimen from Solano County (UCDC) may belong to this species as well.

angustifrons Compere 1957: 227

Type. USNM

Distribution. E (Riverside, San Bernardino, San Diego)

Host/habitat. *Coccus hesperidum*

Remarks. In the 1950s, this species was repeatedly imported into California from the Orient against *Coccus hesperidium* and *Saissetia oleae*, but it was never considered established here (Bartlett 1978a; Lampson & Morse 1992) until Kapranas *et al.* (2007) found it 50 years later in a survey of *C. hesperidum* parasitoids. Three scale species (*Coccus pseudomagnoliarum*, *Pulvinaria psidii* and *S. oleae*) have been reported as hosts of *M. angustipennis* (Noyes & Hayat 1994; Noyes 2001), based upon citations from Bartlett (1978a) and Cock (1985) but I consider these records dubious, at best. For *C. pseudomagnoliarum*, Barlett (page 61) noted that *M. angustipennis* (among other species) reportedly "showed some interest in this scale in the laboratory", and for *S. oleae*, Bartlett (page 69) simply reported that the parasitoid was imported in a biocontrol program, without any evidence that the scale was actually an acceptable host. The record of *P. psidii* is traceable to its importation into Bermuda in the 1950s, when Bennett & Hughes (1959) reported that many parasites from California of "unknown value" against the scale were imported, and among these was *M. angustifrons*, which did not become permanently established there. This species is very close to *M. stanleyi*, and Rugman-Jones *et al.* (2011), suggest that records of the former may be applicable to the latter.

anneckei Guerrieri & Noyes 2000

Type. PPRI

Distribution. E (Alameda, Los Angeles, Riverside, San Diego, Santa Clara, Ventura, *San Francisco Bay area*, *Central Valley*)

Host/habitat. *Coccus hesperidum*, *Saissetia miranda*, *S. oleae, Waxiella mimosae*; **NEW**: *Parasaissetia nigra* (UCRC)

Remarks. Early in the 20th century, the South African species *Metaphycus lounsburyi* was exported to several countries (including Australia) in biocontrol programs directed against *Saissetia oleae*. However, Guerrieri & Noyes (2000) realized that two parasitoid species were involved, and described the second one as *M. anneckei*, noting that much of the literature about *M. lounsburyi* may refer to *M. anneckei*. In 1916, "*M. lounsburyi*" was imported from Australia and became established in southern California (Smith & Compere 1928), but Noyes (in litt.) thinks this was likely *M. anneckei*. Bartlett (1978a) reported that *M. lounsburyi* (presumably *M. anneckei*) may be the second most effective parasitoid of the black scale in the State, while Kennett (1986) and Lampson & Morse (1992) found it to be much less important. Specimens labelled as this species are recorded from "*Lecanium viridis*" (= ?*Coccus viridis* Green) and *Parthenolecanium corni* (both UCRC), but I suspect these are misidentifications.

argyrocomus (Compere 1947: 10) (*Erythraphycus*)

Type. USNM

Distribution. C (Lassen, Marin, Monterey, Riverside)

Host/habitat. *Eriococcus* sp.

armitagei (Compere 1926a: 30) (*Aenasioidea*)

Type. USNM

Distribution. C (Los Angeles, Marin)

Host/habitat. The original description was based on a specimen collected on a *Quercus* sp. in Los Angeles, which led Compere to opine that the host was likely to be a *Kermes* sp., but such an association has never been established. A single specimen (RLZC) was collected on *Quercus agrifolia* in Marin County, indicating that the species extends throughout California's central coast area.

californicus (Howard 1898a: 245) (*Aphycus*)

Type. USNM

Distribution. N (Butte, Calaveras, Contra Costa, El Dorado, Lassen, Los Angeles, Madera, Marin, Monterey, Nevada, Plumas, Riverside, San Benito, San Bernardino, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Sonoma, Stanislaus, Tulare, Yolo)

Host/habitat. *Eulecanium* sp., *Mesolecanium nigrofasciatum*, *Parthenolecanium corni*, *P. pruinosum*

Remarks. Timberlake (1916) thought that *M. oregonensis* (Howard 1898a) was probably the male of *M.*

californicus, and later suggested that *M. pulvinariae* (Howard 1881) might be synonymous as well (Compere & Annecke 1961). This same paper noted that *M. californicus* was indistinguishable from the imported Palearctic *M. insidiosus* (Mercet 1921), although there is no evidence that the latter ever established in California. They also reported that *M. californicus* is likely to be confused with *M. stanleyi* Compere morphologically, although these two species can be separated based on host species. Two specimens from Santa Barbara County (USNM) that seems to be referable to this species were reared from *Physokermis insignicola*.

calvus (Compere 1947: 11) (*Erythraphycus*)

Type. USNM

Distribution. C (Contra Costa, Marin, Riverside, San Benito, San Bernardino, Santa Clara, Solano, Stanislaus)

Host/habitat. Collected on an *Eriogonum* sp. (Polygonaceae)

Remarks. Compere described this species with only the first two funicular segments darkened, but here I include a series of specimens which have the 3rd and 4th segments darkened as well.

clauseni (Timberlake 1918: 358) (*Pseudococcobius*)

Type. USNM

Distribution. C (Alameda, Calaveras, Contra Costa, Imperial, Kern, Los Angeles, Marin, Napa, Riverside, San Benito, San Bernardino, San Diego, Santa Clara, Sonoma, Stanislaus)

Host/habitat. *Amonostherium lichtensioides*, *Eriococcus adenostomae*, *E. palustris, E*. sp.; **NEW**: *Eriococcus coccineus* (UCRC)

Remarks. Timberlake (1918) recorded this species from an "*Erium* sp." on cactus, which Peck (1951) considered possibly an *Amonostherium* species. Essig (1926) reported the association with *E. palustris* on *Spartina foliosa* (Poaceae), which is limited to the high tide zone in the San Francisco Bay area. I have collected specimens over a range of ecological habitats, including the Sierra foothills, inland chapparal, and the coastal plain.

coquilletti (Howard 1898a: 244) (*Aphycus*)

Type. USNM

Distribution. N (Los Angeles)

Host/habitat. *Pulvinaria bigeloviae*

eriococci (Timberlake 1916: 631) (*Aphycus*)

Type. USNM

Distribution. N (Contra Costa)

Host/habitat. *Coccus hesperidum*, *Eriococcus quercus*

Remarks. Originally described from Utah, Essig (1926) reported this species from California, without providing a more specific location. I've found only one specimen from California, from Mt. Diablo State Park.

eruptor (Howard 1881: 364) [**New state record**] (CSCA, RLZC)

Type. USNM

Distribution. W (Marin, San Diego)

Host/habitat. *Ceroplastes cirridpediformis*, *C. floridensis*, *C*. sp., "*Lecanium* sp."

flammeus Compere 1947:13

Type. USNM

Distribution. C (Alameda, Calaveras, Contra Costa, Kern, Los Angeles, Marin, Mendocino, Plumas, Santa Clara, Sierra, Solano, Tehama)

Host/habitat. *Parthenolecanium quercitronis*

fumipennis (Timberlake 1918: 356) (*Pseudococcobius*)

Type. USNM

Distribution. N (Riverside, San Bernardino)

Host/habitat. *Eriococcus* sp., *Phenacoccus solani*

Remarks. Timberlake (1918) reported this species was reared from *Pseudococcus solani* (Cockerell) in southern California (San Bernardino County). However, it is likely that Timberlake's identification of the host was based on Essig's (1909 or 1914) characterization, which was a misidentification of *Phenacoccus solani* (Ben-Dov 2006b). Certainly, in a later work Essig (1926: 833) reported the parasitoid (as *Pseudococcobius fumipennis*) "Reared from *Phenacoccus solani* Ferris in southern California" and did not include any mention of *Pseudococcus solani*, suggesting that he recognized the initial record of this species to be a mistake. Further, while *Phenacoccus solani* is known from throughout California (McKenzie 1967), *Pseudococcus solani* is known only from New Mexico (Ben-Dov 2006b).

funicularis Annecke 1965: 227

Type. SANC

Distribution. E (Alameda, Marin, Monterey, Santa Cruz, Yolo)

Host/habitat. *Pulvinaria delottoi*, *Pulvinariella mesembryanthemi, P.* sp.

Remarks. This species was introduced from South Africa with *M. stramineus* in a biocontrol program against *P. delottoi* and *P. mesembryanthemi* from 1978–1983, and along with *Encyrtus saliens*, is credited with successfully controlling both scale species (Tassan & Hagen 1995). The record of *M. funicularis* being used in a biocontrol program against *Saissetia oleae* (Lampson & Morse 1992) appears to be in error.

fuscipennis (Howard 1898a: 241) (*Aphycus*)

Type. USNM

Distribution. C (Alameda, Amador, Calaveras, Contra Costa, El Dorado, Kern, Marin, Monterey, San Benito, San Bernardino, Santa Barbara, Santa Clara, Sonoma, Stanislaus)

Host/habitat. *Eulecanium* sp. on *Arctostaphylos pungens* (Ericaceae)

Remarks. Both Howard (1898a) and Compere (1947) reported this species from undetermined "*Lecanium*" species, but this generic name has since been suppressed under *Eulecanium* Cockerell. Essig (1926) ascribed the original host record from *Arctostaphylos* in Sonoma County to *Parthenolecanium corni*, but this conclusion is questionable since *P. corni* has not otherwise been associated with any *Arctostaphylos* species.

hageni Daane & Caltagirone 1999: 14

Type. EMEC

Distribution. E (Tehama)

Host/habitat. *Saissetia oleae*

Remarks. This is a European species, imported from Spain in 1985 during a biocontrol program against *Saissetia oleae* (Daane & Caltagirone 1999) and has been confused with both *M. anneckei* and *M. lounsburyi* (Guerrieri & Noyes 2000).

helvolus (Compere 1926a:25) (*Aphycus*)

Type. USNM

Distribution. E (Alameda, Contra Costa, Kern, Los Angeles, Marin, Merced, Modoc, Monterey, Orange, Placer, Riverside, San Bernardino, San Diego, San Francisco, San Mateo, Santa Clara, Stanislaus, Tulare, Ventura)

Host/habitat. *Ceroplastes destructor*, *C. helichrysi*, *C.* sp., *Coccus hesperidum*, *C. pseudomagnoliarum*, *Coccus viridis*, *Eucalymnatus tessellatus, Marsipococcus proteae*, *Parasaissetia litorea, P. nigra*, *P.* sp., *Parthenolecanium corni*, *P. persicae*, *Protopulvinaria pyriformis*, *Pulvinaria aethiopica*, *P. psidii*, *P. urbicola*, *Pulvinariella mesembryanthemi*, *Saissetia coffeae*, *S. nigrella*, *S. oleae*, *S. somereni*, *S.* sp.; **NEW**: *Coccus africanus*, *Parlatoria pergandii* (both UCRC)

Remarks. This is a south African species which was established in California in 1937 in a biocontrol program for *Saissetia oleae,* and is one of its most effective imported natural enemies (Bartlett 1978a; Kennett 1986; Daane *et al.* 1991; Lampson & Morse 1992). Noyes (2001) listed *M. helvolus* as a biocontrol agent of *Aonidiella aurantii*, but this is misleading—the paper he cited (Bellows & Morse 1988) merely noted the effect of pesticides (applied for *A. aurantii* control) on parasitoids of other species. Guerrieri & Noyes (2000) note that *Aspidiotus* sp. (Homoptera: Diaspididae) and *Rastrococcus mangiferae* (Green) (Homoptera: Pseudococcidae), have been reported as hosts, but they consider these records questionable.

howardi (Cockerell 1898: 276) (*Aphycus*)

Type. USNM

Distribution. N (Lassen, Riverside)

Host/habitat. *Eriococcus tinsleyi*, *E*. sp.

Remarks. Two specimens (UCDC) from Imperial County may belong to this species as well.

immaculatus (Howard 1894: 235) (*Aphycus*) [**New combination**]

Type. USNM

Distribution. C (Los Angeles)

Host/habitat. *Aonidiella aurantii*

Remarks. The species was described in *Aphycus*, based on a single male. Timberlake (1916) was unable to locate the type, and opined that if it was a true *Aphycus*, then the host record of *A*. *aurantii* was "undoubtedly erroneous". The holotype is slide type #1474 at the USNM, and belongs in *Metaphycus*, which means the original host record may be correct.

inviscus Compere 1940a: 20

Type. BMNH

Distribution. E (Contra Costa, Fresno, Marin, Santa Cruz, Sonoma, Tulare)

Host/habitat. *Saissetia oleae*, *S*. sp.

Remarks. Native to South Africa, this species was imported into California at least twice. A specimen mentioned in the original description was reared from the Riverside Insectary in 1924—probably imported in one of the shipments of parasitoids made by E.W. Rust in the 1920s (Compere 1940b)—but there is no record of this species being released then. A second importation was made in 1979, and the species was recovered soon thereafter in the Central Valley (Kennett 1986). Bartlett (1978a) reported a third importation of this species in1958, which apparently failed to establish. However, Annecke & Mynhardt (1972) considered this effort involved a species that is distinct from *M. inviscus* and described it as *M. bartletti* (now a junior synonym of *M. lounsburyi*).

kermicola (Timberlake 1916: 583) (*Aenasioidea*)

Type. USNM

Distribution. N (Los Angeles)

Host/habitat. *Allokermes essigi*, *A. galliformis*

Remarks. The host record of *Allokermes* (= *Kermes*) *nigropunctatus* (Ehrhorn & Cockerell) cited in Essig (1926) is a misidentification of *A*. *essigi* (Miller & Gimpel).

lecanii (Howard 1898a: 242) (*Aphycus*)

Type. USNM

Distribution. C (Alameda, Los Angeles, Santa Barbara)

Host/habitat. *Eulecanium pubescens*, *E*. sp., *Parthenolecanium corni*, *P. quercifex*, *Physokermes insignicola*

lounsburyi (Howard 1898a: 244) (*Aphycus*)

Type. USNM

Distribution. E (Alameda, Marin, Riverside, San Diego, San Mateo, Santa Barbara, Santa Clara, Solano, Tulare, Ventura, Yolo)

Host/habitat. *Ceroplastes floridensis*, *Coccus capparidis*, *C*. *hesperidum*, *C*. *pseudomagnoliarum*, *Lichtensia viburni*, *Parthenolecanium corni*, *Saissetia coffeae, S. oleae*

Remarks. This species is native to South Africa, and has been exported as a parasitoid of *Saissetia oleae* to several countries. However, Guerrieri and Noyes (2000) discovered that material identified as *M. lounsburyi* included a second species, which they described as *M. anneckei*, noting that previous literature references to *M. lounsburyi* may be referrable to *M. anneckei*. One such reference includes Smith and Compere's (1928) report of material imported from Australia into California in 1916, which Noyes (in litt.) thinks was likely *M. anneckei*. In 1958, a species identified as *M. inviscus* was imported from South Africa into California (Bartlett 1978a), but Annecke & Mynhardt (1972) considered this material represented a new species, which they described as

Metaphycus bartletti. Based on a comparison of types, Guerrieri & Noyes (2000) synonymized *M. bartletti* under *M. lounsburyi*. This makes *M. lounsburyi* represents one of the most widespread and important natural enemies of *S. oleae* in California (Smith & Compere 1928; Bartlett 1978a; Kennett 1986, Daane *et al.* 1991; Lampson & Morse 1992). In his report on the parasitoids of *S. oleae* in central and northern California, Kennett (1986) reported distinct biological differences between the taxa he identified as *M. lounsburyi* and *M. bartletti*: the latter was one of the most common species found (in both the interior valley as well as the coastal and subcoastal areas), while the former appeared to be largely limited to the more temperate coastal area. Noyes (in litt.) suspects Kennett's *M. lounsburyi* was really *M. anneckei*, and his *M. bartletti* was *M. lounsburyi*. Two specimens that appear close to *M. lounsburyi* were taken in Contra Costa and Kern counties (RLZC).

luteolus (Timberlake 1916: 636) (*Aphycus*)

Type. USNM

Distribution. W (Butte, Fresno, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Tulare, Ventura, Yolo, Yuba)

Host/habitat. *Coccus hesperidum*, *C. pseudomagnoliarum*, *Parthenolecanium corni*, *Pulvinaria psidii*, *Pulvinariella mesembryanthemi*, *Saissetia coffeae*, *S. oleae*

Remarks. This species may prove to be a junior synonym of *M. flavus* (Howard) (Guerrieri & Noyes 2000). These authors also note that the host record of *Saissetia coffeae* was incorrect, based upon an error in Herting (1972). However, *S. coffeae* is now considered the senior synonym of *S. hemisphaerica* (Ben-Dov 2006a), and there are several records of that species serving as a host for *M. luteolus*. *Coccus viridis* has been noted as host of *M. luteolus* (Noyes & Hayat 1994: 398), based on its use in biocontrol programs against the scale in Bermuda and Hawaii. However, *M. luteolus* failed to establish in both cases, and there is no record of it successfully attacking this host (Bennett & Hughes 1959; Bartlett 1978a). Specimens (UCRC) have been reportedly reared from *Aonidiella aurantii* and *Parlatoria pergandii* (both Hemiptera: Diaspididae), but these records need to be confirmed.

matteolus (Compere 1947: 11) (*Erythraphycus*)

Type. USNM

Distribution. C (Contra Costa, Imperial, Kern, Los Angeles, Marin, Merced, Napa, Riverside, San Bernardino, Solano, Stanislaus)

Host/habitat. Host unknown, but this species is common in chaparral, collected off *Adenostoma fasciculatum*, *Chilopsis linearis arcuata* (Bignoniaceae), *Juniperus californicus* (Cupressaceae) and *Larrea tridentata* (Zygophyllaceae).

Remarks. This species was described based on a single male specimen (Compere, 1947). There are a series of females (EMEC, RLZC) that match the original description exactly, except for the color of the fore- and hind tibiae. Given the propensity for sexual dimorphism in the Encyrtidae, I have no hesitation in considering these females conspecific with *M. matteolus*. The specimen from Merced County (EMEC) was labeled "ex *Desmia* on wild grape", but I think it likely this simply indicates the specimen was collected on grape (Vitaceae) infested with a *Desmia* species, and does not reflect an actual rearing record.

physokermis (Timberlake 1916: 606) (*Aphycus*)

Type. USNM

Distribution. C (Alameda, Contra Costa, Humboldt, Plumas, Santa Barbara)

Host/habitat. *Physokermis insignicola*

psyllidis Compere 1943: 72

Type. USNM

Distribution. C (Los Angeles, Orange, Santa Barbara, Santa Clara, Ventura)

Host/habitat. *Bactericera cockerelli*

Remarks. This is one of only three species in the genus recorded as psyllid parasitoids (Guerrieri & Noyes 2000).

stanleyi Compere 1940a: 20

Type. Lost

Distribution. E (Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Tulare, Ventura)

Host/habitat. *Ceroplastes brevicauda*, *C*. sp., *Coccus alpinus*, *C*. *celatus*, *C*. *hesperidum*, *C*. *pseudomagnoliarum*, *C*. *viridis*, *Eucalymnatus tessellatus*, *Lichtensia chilianthi*, *Parasaissetia nigra*, *P.* sp., *Protopulvinaria pyriformis*, *Pulvinariella mesembryanthemi*, *Pulvinaria psidii*, *Saissetia coffeae*, *S. nigrella*, *S. oleae***,** *Saissetia somereni*, *S.* sp.; **NEW**: *Pulvinarisca jacksoni* (UCRC)

Remarks. Although the name is properly ascribable to Compere 1940a, the full description is found in Compere 1940b. Native to Africa, this species was imported into California in 1937 in a biocontrol program against *Saissetia oleae*, and immediately became established (Compere 1940a, 1940b; Bartlett 1978a). This species was recovered in southern California over 55 years later at very low levels (Lampson & Morse 1992), but was not found in central or northern California (Kennett 1986; Daane *et al.* 1991). Bernal *et al.* (2001) reported this species on citrus from the southern San Joaquin Valley (Fresno, Kern and Tulare counties) without specifying exactly in which county this species occurred. This species is very similar to *M. californicus*, separable only by differences in hosts (Compere & Annecke 1961). A host record of *Coccus subhemisphaericus* (Newstead) is doubtfully referred to *M. stanleyi* (Compere 1940a).

stramineus Compere 1940a: 28

Type. BMNH

Distribution. E (Alameda, Monterey, San Mateo)

Host/habitat. *Pulvinaria delottoi*, *Pulvinariella mesembryanthemi*

Remarks. Imported from South Africa from 1978–1983 in a biocontrol program against iceplant scales, this species, along with *Encyrtus saliens* and *Metaphycus funicularis*, established immediately and are credited with the successful control of those species (Tassan & Hagen 1995).

trimblei (Dozier 1936: 183) (*Aenasioidea*)

Type. USNM

Distribution. N (San Bernardino)

Host/habitat. *Parthenolecanium quercifex*

Remarks. The only primary literature record of this species is the original description, based on specimens from Caledonia, Pennsylvania. Noyes (2001) noted the type was from California, but I suspect this was a misreading of "Caledonia". However, there is a single specimen of this species collected from San Bernardino County (UCRC).

zebratus (Mercet 1917: 138) (*Aphycus*)

Type. MNMS

Distribution. E

Host/habitat. *Ceroplastes floridensis*, *Drepanococcus cajani*, *Eriopeltis festucae*, *E. lichtensteini*, *Lecanopsis formicarum*, *Luzulaspis luzulae*, *Parthenolecanium corni*, *P. persicae*, *P. pomeranicum*, *P. rufulum*, *Pulvinaria vitis*, *Saissetia oleae*

Remarks. This is a Palearctic species, imported into California in 1986 in a biocontrol program against *Saissetia oleae*. The species was released in northern and central California (Alameda, Contra Costa, Fresno, Glenn, Madera & Tehama counties), recovered and considered established, although the exact localities were not specified (Lampson & Morse 1992). Questionable host records for this species include *Aonidiella orientalis*, *Planchonia arabidis*, *Nipaecoccus* sp., *Phenacoccus aceris* and *Trionymus perrisi*.

spp.

Remarks. In addition to the described species listed above, I have seen specimens that appear to represent up to 31 undescribed morphospecies from the state (LACM, RLZC, SBMN, UCDC, UCFC, UCRC).

***Microterys* Thomson 1876**

Hosts. Hemiptera: Coccidae, Eriococcidae, Kermesidae

mazzinini Girault 1917a: 12

Type. USNM

Distribution. C (Inyo, San Bernardino, Santa Barbara, Tulare)

Host/habitat. *Physokermes insignicola*

nietneri (Motschulsky 1859: 170) (*Encyrtus*)

Type. ZMUM

Distribution. W (Alameda, Contra Costa, Fresno, Kern, Los Angeles, Napa, Orange, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Mateo, Santa Barbara, Santa Clara, Solano, Tehama, Tulare, Ventura)

Host/habitat. *Ceroplastes cirripediformis*, *C. destructor*, *C. floridensis*, *C. japonicus*, *C. rubens*, *Coccus hesperidum*, *C. pseudomagnoliarum*, *C. viridis*, *Eucalymnatus tessellatus*, *Eulecanium* sp., *Gascardia* sp., *Maacoccus piperis*, *Milviscutulus mangiferae*, *Parasaissetia nigra*, *Parthenolecanium cerasifex*, *P. corni*, *P. fletcheri*, *P. persicae*, *Protopulvinaria pyriformis*, *Pulvinaria mammeae*, *P. peregrina*, *P. psidii*, *P. vitis*, *Pulvinariella mesembryanthemi*, *Saissetia coffeae*, *S. miranda*, *S. oleae*, *S.* sp.

Remarks. *Microterys nietneri* is a widespread (perhaps even cosmopolitan) species, but it is not clear if it occurs naturally in California. Howard (1881) described *Encyrtus flavus* from Los Angeles County, but Timberlake (1913) and Bartlett & Lagace (1961) noted that this species was also known from Asia and opined it had been accidentally established here. In the1950s a "black scale race" of this species was introduced from India and Pakistan in a series of (apparently unsuccessful) biocontrol introductions (Clausen 1959; Bartlett 1978a). In 1989, Trjapitzin synonymized *E. flavus* under *M. nietneri*. Bartlett & Lagace (1961) and Rosen & Kfir (1980) noted that several geographical strains of this species exist, and they differ in their host preferences. Noyes (2001) includes a host record of "*Coccus piperus*", referred to Hayat's (1986) catalog of Indian Encyrtidae, but in that work the host is properly spelled as "*Coccus piperis*" (now placed in the genus *Maacoccus*). There are specimens reportedly reared from *Aonidiella aurantii* (UCRC), but this identification is questionable.

physokermis Compere 1926b: 43

Type. USNM

Distribution. C (Alameda, Calaveras, Contra Costa, Madera, Monterey, Napa, San Francisco, Santa Clara)

Host/habitat. *Physokermis insignicola*

Remarks. Noyes (2001) mistakenly recorded this species from Japan.

sylvius (Dalman 1820: 154) (*Encyrtus*)

Type. NHRS

Distribution. W (Calaveras, El Dorado, Inyo, Lassen, Los Angeles, Merced, Modoc, Napa, Plumas, Riverside, San Bernardino, San Diego, *Yosemite National Park*)

Host/habitat. *Didesmococcus unifasciatus*, *Eulecanium ficiphilum* (nec *ficifilum*), *E. nocivum*, *E. sericeum*, *E. tiliae*, *E.* sp., *Parthenolecanium corni*, *P. persicae*, *P. rufulum*, *Physokermes jezoensis*, *Rhodococcus perornatus*, *R. spiraeae*, *R. turanicus*, *Sphaerolecanium prunastri*, *Stotzia maxima*

Remarks. This is a Holarctic species that was originally recorded from California under the junior synonym *M. titiani* Girault (1917a).

xanthopsis Compere 1926b: 41

Type. USNM

Distribution. N (Alameda, Amador, Calaveras, Contra Costa, Inyo, Kern, Los Angeles, Marin, Napa, Placer, Riverside, San Bernardino, San Francisco, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Stanislaus, Tulare, Yolo)

Host/habitat. *Parthenolecanium corni*, *P. persicae*

Remarks. Noyes (2001) mistakenly recorded this species from Japan.

yolandae Compere 1926b: 39

Type. USNM

Distribution. C (Alameda, Contra Costa, Riverside, San Benito, Solano, Tulare, Yolo)

Host/habitat. *Kermes cockerelli*

Remarks. Noyes (2001) mistakenly recorded this species from Japan.

spp.

Remarks. I have seen specimens that appear to represent an additional seven morphospecies present in the state (EMEC, LACM, RLZC, SBMN, UCFC, UCRC). One of these species had previously (Dreistadt & Hagen, 1994) been reported as a parasitoid of *Eriococcus spurius*, and it is not clear if it is a native species or if it had been introduced into the state.

Mucrencyrtus Noyes 1980

variabilis Sharkov 1996: 366

Type. CNC

Distribution. N (Marin, San Luis Obispo, Stanislaus, Tuolumne)

Host/habitat. Unknown

Remarks. Several extralimital species of this genus are known to attack Aclerdidae (Hemiptera).

Neococcidencyrtus Compere 1928

Hosts. Hemiptera: Diaspididae

poutiersi (Mercet 1922: 399) (*Coccidencyrtus*)

Type. MNMS

Distribution. W (Los Angeles)

Host/habitat. *Furchadaspis zamiae*

Remarks. This is a Holarctic species, recorded from California in the original description of a junior synonym, *N. alula* Compere 1928.

Oesol Noyes & Woolley 1994

Hosts. Hemiptera: Kermesidae

anubis Noyes & Woolley 1994: 1334

Type. USNM

Distribution. N (San Benito)

Host/habitat. *Kermes cockerelli*

Oobius Trjapitzin 1963

Hosts. Coleoptera: Buprestidae, Cerambycidae; Diptera: Asilidae

buprestidis Gordh & Trjapitzin 1981: 7 (*Avetianella*) [**New state record**](EMEC, RLZC, UCF)

Type. USNM

Distribution. N (Contra Costa, El Dorado, Lassen, Los Angeles, Tuolumne)

Host/habitat. *Buprestus aurulentus*

Remarks. This species was previously known from only one site in Oregon (Gordh & Trjapitsin 1981).

dahlsteni (Trjapitzin 1971): 507 (*Avetianella*)

Type. CAS

Distribution. C (El Dorado, Madera, Siskiyou)

Host/habitat. The host is unknown, but specimens were collected in bark beetle traps on *Pinus lambertina*.

longoi (Siscaro 1992): 206 (*Avetianella*)

Type. IAEC

Distribution. E (Riverside, San Diego)

Host/habitat. *Coptocercus aberrans*, *Epithora dorsalis*, *Phoracantha semipunctata*

Remarks. Imported from Australia in a biocontrol program directed against *P. semipunctata.* This species was released from 1993–1995 in San Diego, Riverside, Orange, Los Angeles, San Bernardino, Santa Barbara, Fresno & Santa Clara counties; it established immediately at several sites, and became an effective natural enemy of the beetle (Hanks *et al.* 1996).

nearctica (Trjapitzin 1977): 160 (*Szelenyiola*)

Type. EMEC

Distribution. C (El Dorado)

Host/habitat. Unknown

Remarks. According to the original description, the holotype was to be deposited at EMEC, but instead it was placed at the USNM. In 2010 the specimen was indeed placed in the EMEC.

spp.

Remarks. Gordh (1979) reported two undetermined species from California (one under the genus *Avetianella*). Specimens that may represent six undescribed species were collected in Alpine, Contra Costa, Imperial, Marin, Nevada, Riverside, San Bernardino, Santa Clara, Shasta, Solano, Tuolumne and Ventura counties (EMEC, LACM, RLZC, UCFC, UCDC, UCRC).

Ooencyrtus Ashmead 1900

Hosts. Coleoptera: Coccinellidae; Hemiptera: Coreidae, Pentatomidae, Reduviidae, Scutelleridae; Hymenoptera: Braconidae; Diptera: Chloropidae; Neuroptera: Chrysopidae; Lepidoptera: Arctiidae, Lasiocampidae, Lymantriidae, Nymphalidae, Saturniidae, Sesiidae

californicus Girault 1917a: 22

Type. USNM

Distribution. N (Inyo, Riverside, Sacramento, Tulare)

Host/habitat. *Anasa tristis*, *Pennisetia marginata*

Remarks. Peck (1963: 428) questioned the host record of *Pennisetia marginata* reported by Johansen (1957), but I'm including it since other *Ooencyrtus* species have been reported as parasitoids of Lepidoptera. A species near to *O. californicus* has been collected from Alameda, Calaveras, Riverside, San Bernardino, Santa Barbara, Solano, Stanislaus and Trinity counties (RLZC). The holotype female is mounted on a slide (USNM) and has been crushed into dozens of pieces. The antenna and one forewing are easily visible, but otherwise the rest of the specimen offers little opportunity to distinguish this species.

kuvanae (Howard 1910: 3) (*Schedius*) [**New state record**] (CSCA)

Type. USNM

Distribution. W (Contra Costa, Riverside)

Host/habitat. *Anastatus japonicus***,** *Anoplocnemis curvipes*, *Chrysoperla carnea*, *Clavigralla tomentosicollis*, *Cotesia melanoscela***,** *Dasychira pinicola*, *Dendrolimus spectabilis*, *Eriogyna pyretorum*, *Euproctis chrysorrhoea***,** *Hemileuca oliviae*, *Leucoma salicis*, *Lymantria fumida*, *L. monacha*, *L. xylina***,** *Malacosoma neustria*, *Orgyia antiqua*, *O. leucostigma***,** *O.* sp., *Porthetria dispar, Suarius fedtschenkoi*

Remarks. Dowden (1962) reported that *O. kuvanae* will reproduce on *Orgyia leucostigma* in the lab, but the parasitoid was never recovered from that host in the field. Peck (1963: 431) noted *O. leucostigma* as a host of *O. kuvanae*, but failed to cite any reference for that record. Specimens identified as near *O. kuvanae* were collected in Napa, Santa Clara and Sonoma counties (EMEC).

submetallicus (Howard 1897: 151) (*Encyrtus*) [**New state record**] (CSCA)

Type. BMNH

Distribution. W (Imperial)

Host/habitat. *Anasa scorbutica*, *Caligo memnon*, *Coleotichus blackburniae*, *Edessa meditabunda*, *E.* sp., *Erinnyis ello*, *Euschistus heros*, *Heliconius* sp., *Liohippelates pusio*, *Hypercompe albicornis*, *Leptoglossus gonagra*, *Mormidea angustata*, *Nezara viridula*, *Oebalus ypsilongriseus*, *Opsiphanes cassina*, *O. tamarindi*, *Piezodorus guildinii*

Remarks. The California record is based upon a single damaged specimen, determined by Burks. The antennae, legs and forewings are all missing, but the remaining body agrees with the redescription provided by Noyes (1979). The specimen was one of several parasitoid species associated with *Ferrisia virgata* on *Tecoma capensi*s (Bignoniaceae).

spp.

Remarks. In addition to the species listed above, I have seen specimens that appear to represent an additional 17 morphospecies present in the state, one of which was reared from *Malacosoma californicum* and *M.* sp. (Langston 1957) (EMEC, RLZC).

Parablastothrix Mercet 1917

Hosts. Lepidoptera: Gracillariidae, Heliozelidae, Lyonetiidae, Nepticulidae

nearctica Miller 1965: 751

Type. CNC

Distribution. N (Alameda, Contra Costa, Marin, Monterey, Sacramento, San Mateo, Santa Barbara, Santa Clara, Solano, Sonoma)

Host/habitat. *Bucculatrix albertiella*, *Coptodisca powellella*, *C.* sp., *Obrussa* sp., *Phyllonorycter sandraella*, *Stigmella variella*; **NEW**: *Cameraria* sp., *Nepticula rhamnicola*, *N.* sp., *Stigmella* sp. (all EMEC)

Remarks. This species is a solitary parasitoid, which suggests it is monoembryonic, an unusual condition for a representative of the Copidosomatini, where this genus is placed (Zuparko 1995b).

spp.

Remarks. A single female, representing a species distinct from *P. nearctica*, was collected from a *Salix* sp. in Lassen County (RLZC). A male specimen undetermined to species was collected in Inyo County (UCDC).

Paratetracnemoidea Girault 1915a [New state record]

americana Gordh 1985: 588 [**New state record**] (UCDC, UCFC)

Type. UCRC

Distribution. N (Inyo, Nevada, Tuolumne)

Host/habitat. Unknown

Remarks. Specimens that appear near to *P. americana* have been collected in Riverside County (UCRC).

Pentelicus Howard 1895a [New state record]

Hosts. Coleoptera: Sphinididae

spp.

Remarks. A series of specimens of this genus were collected in Yuba County from a slime mold on a log populated with Lathridiidae (Coleoptera), and another single specimen was collected in San Mateo County (RLZC).

Perpolia Noyes & Woolley 1994 [New state record]

spp.

Remarks. Undetermined specimens from this genus were collected off *Chrysothamnus* (Asteraceae), *Pinus* ?*jeffreyi* and from chapparal habitats in Inyo, Los Angeles, Placer, Riverside, San Benito, San Diego, Santa Barbara, Santa Clara and Stanislaus counties (RLZC, UCRC). Another specimen that may be referable to this genus was collected in Solano County (UCDC).

Plagiomerus Crawford 1910

Hosts. Hemiptera: Diaspididae

diaspidis Crawford 1910: 90

Type. USNM

Distribution. W (Alameda, Butte, Inyo, Lassen, Los Angeles, Marin, Mendocino, Orange, Riverside, San Bernardino, Santa Barbara, Santa Clara, Stanislaus, Tuolumne, Yuba)

Host/habitat. *Clavaspis* sp., *Diaspis echinocacti*, *Hemiberlesia lataniae*; **NEW**: *Chionaspis ortholabis* (EMEC), *Lepidosaphes* sp. (UCRC)

Remarks. De Santis (1979) lists "*Clovastis* sp." as a host—presumably a misspelling of "*Clavaspis* sp." Two species of *Plagiomerus* (*P. diaspidis* and *P. cyaneus* Ashmead, 1888) reported from the Nearctic Region, and a third (*P. hospes* Timberlake, 1920) from the Neotropical Region, are mostly distinguished from each other based on the color and relative dimensions of the funicle segments. Specimens from California (some from the same localities) generally resemble *P. diaspidis*, but reflect this range of antennal variation, suggesting a high degree of variation in this species, and that these characteristics are therefore of questionable use in distinguishing species.

Prionomastix Mayr 1876 [New state record]

biformis (Ashmead 1900: 370)(*Chestomorpha*) [**New state record**](EMEC, UCDC, UCRC)

Type. USNM

Distribution. N (Inyo)

Host/habitat. Specimens were collected on *Larrea divaricata*.

spp.

Remarks. Male specimens from San Diego and Sierra counties (UCDC, UCRC) may represent an undescribed species.

Prionomitus Mayr 1876

Hosts. Hemiptera: Psyllidae, Triozidae

mitratus (Dalman 1820: 352) (*Encyrtus*)

Type. NHRS

Distribution. W (Alameda, Butte, Contra Costa, El Dorado, Fresno, Inyo, Kern, Lassen, Los Angeles, Marin,

Modoc, Mono, Monterey, Napa, Nevada, Placer, Plumas, Riverside, San Bernardino, San Diego, Santa Barbara, Sierra, Solano, Sonoma, Stanislaus, Tuolumne, Ventura, Yolo, Sequoia National Park)

Host/habitat. *Cacopsylla americana*, *C. bidens*, *C. crataegi*, *C. mali*, *C.* sp. nr. *media*, *C. melanoneura*, *C. peregrina*, *C. pyri*, *C. pyricola*, *C. ribesiae*, *Ceanothia essigi*, *C. insolita*, *Euglyptoneura fuscipennis*, *E. minuta*, *E. robusta*, *Livilla retamae*, *Pexopsylla cercocarpi*, *Psylla pyrisuga*, *Trioza beameri*; **NEW**: *Arytaina* sp. (EMEC), *Psylla alni* (UCRC), *Psylla floccosa, P.* sp. (EMEC),

Remarks. This is a Holarctic species, reported from several psyllid species in the western United States (Jensen 1957). Nevertheless, this species was imported from Switzerland into California in the 1960s in a biocontrol program against *Cacopsylla pyricola* (Clausen 1978b).

tiliaris (Dalman 1820: 171) (*Encyrtus*) [**New state record**] (CAS, EMEC, LACM, RLZC, SBMN, UCDC, UCRC)

Type. NHRS

Distribution. W (Alameda, Contra Costa, El Dorado, Fresno, Glenn, Humboldt, Kern, Los Angeles, Marin, Monterey, Napa, Nevada, Placer, Plumas, Riverside, Sacramento, San Bernardino, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Sierra, Solano, Sonoma, Stanislaus, Ventura)

Host/habitat. *Cacopsylla mali, C. melanoneura*, *C. peregrina*, *C. pyri*, *C. ulmi*; **NEW**: *Cacopsylla tenuata* (RLZC), *Psylla* sp. (EMEC)

Remarks. This species has previously been reported only from the Palearctic Region. Peck (1963) noted it questionably occurred in the Nearctic Region, but this record appears to trace to Howard's report of its presence in St. Vincent (Riley *et al.* 1894), which apparently was based on a misidentification of *Psyllaephagus rotundiformis* (Howard) (Noyes 1980). This species has been present in the state since at least 1930, when two specimens were collected in Alameda County (UCRC).

***Prochiloneurus* Silvestri 1915**

Hosts. Hyperparasitoid of Hemiptera: Pseudococcidae via Hymenoptera: Encyrtidae

dactylopii (Howard 1885: 17) (*Chiloneurus*) [**new state record**] (RLZC, UCRC)

Type. USNM

Distribution. W (Alameda, Contra Costa, Glenn, Imperial, Marin, Orange, Santa Clara, Stanislaus, Tulare, Ventura)

Host/habitat. Hyperparasitoid of *Ferrisia virgata*, *Phenacoccus manihoti*, *P. solenopsis*, *P.* sp., *Planococcus citri*, *Pseudococcus comstocki*, *P.* sp., *Puto barberi* via *Anagyrus diversicornis*, *A. lopezi*, *Leptomastix dactylopii* and *Zarhopalus putophilus*.

Remarks. De Santis (1980) reported *Coccus viridis* and *Chrysopa* sp. as hosts for this species, evidently based on Parker *et al.* (1953), but the latter paper simply reported that *P. dactylopii* was reared from a lot containing (principally) *Coccus viridis* and some *Chrysopa* cocoons—there is no conclusive evidence it emerged from either of these taxa. However, De Santis & Fidalgo (1994) reported a single female of this species had emerged from the pupa of a *Sympherobius* sp. (Neuroptera: Hemerobiidae) collected in Chile—a record which, in my opinion, needs to be confirmed. A specimen from Orange County (UCRC) was labeled as "working on *C. citrophilus*" (probably =*Pseudococcus calceolariae*). Several specimens from Alameda, Contra Costa, Glenn, Imperial, Santa Barbara and Santa Clara counties appear to be intermediate between *P. dactylopii* and *P. modestus* (RLZC, UCDC).

modestus (Timberlake 1924: 240) (*Achrysopophagus*)

Type. USNM

Distribution. C (Fresno, Orange, Riverside, Tulare, Yuba)

Host/habitat. Hyperparasitoid of *Pseudococcus maritimus* via *Anagyrus yuccae* and *Zarhopalus corvinus*; **NEW**: *P. comstocki* (UCRC)

spp.

Remarks. Specimens that appear to represent three undescribed species have been collected from Alameda, Marin, San Bernardino and Santa Barbara counties (EMEC, RLZC, SBMN, UCRC).

***Pseudencyrtoides* Gordh & Trjapitzin 1975**

Hosts. Diptera: Cecidomyiidae

cupressi Gordh & Trjapitzin 1975: 872
Type. USNM
Distribution. C (Marin, San Luis Obispo, Sonoma)
Host/habitat. *Walshomyia cupressi*
Remarks. Specimens determined as *Pseudencyrtoides* or near *Pseudencyrtoides* were collected from San Bernardino and San Diego counties (UCRC).

***Pseudencyrtus* Ashmead 1900 [New state record]**

Hosts. Diptera: Cecidomyiidae

spp.
Remarks. Specimens that appear to represent 11 morphospecies of this genus have been collected from Alameda, Calaveras, Contra Costa, Fresno, Kern, Marin, Modoc, Mono, Monterey, Nevada, Riverside, Sacramento, San Benito, San Bernardino, San Joaquin, Solano, Sonoma, Stanislaus, Sutter, Tuolumne and Yolo counties (CSCA, EMEC, RLZC, UCDC, UCFC, UCRC). Two host records (UCRC) are from Syrphidae: *Allograpta* sp., and a larva attacking *Aphis gossypii*.

***Pseudhomalopoda* Girault 1915e [New state record]**

Hosts. Hemiptera: Diaspididae

spp.
Remarks. A single specimen (CSCA) was collected on an aphid-infested pecan tree (*Carya* sp., Juglandaceae) in Orange County, and identified as *Pseudhomalopoda* nr. *guamensis* by Burks in 1959. The specimen is now badly damaged, and all that remains is the mesosoma (with a pin running through the scutellum), two legs, one forewing and one hind wing. The fore wing venation nearly matches that of *Pseudhomalopoda prima* Girault 1915e, so it appears that the determination by Burks is correct. Besides armored scales, hosts recorded in the literature include Aleyrodidae and Coccidae.

***Psilophryoidea* Compere 1928**

Hosts. Hemiptera: Kermesidae

comesor Compere 1928: 215
Type. USNM
Distribution. C (Yolo)
Host/habitat. *Kermes cockerelli*

***Psyllaephagus* Ashmead 1900**

Hosts. Hemiptera: Aphalaridae, Psyllidae, Triozidae

bliteus Riek 1962: 722

Type. ANIC

Distribution. E (*Central Valley*, *San Francisco Bay Area*, *Central Coastal area, southern California coastal and inland areas*)

Host/habitat. *Creiis costatus*, *Glycaspis brimblecombei*, *G.* sp.

Remarks. This species was imported from Australia and released in California in a biocontrol program against *Glycaspis brimblecombei* on *Eucalyptus camaldulensis* (Myrtaceae) in 2000 and immediately established (Dahlsten *et al.* 2003; Daane *et al.* 2005). Further releases resulted in establishment throughout the Central Valley and coastal areas of central and southern California, with pest suppression more effective in the cooler, coastal areas (Dahlsten *et al.* 2008). It appears to be a very vagile species, as I have collected it in two sites that appear to have no *Eucalyptus* species in the immediate vicinity.

brachiatus Riek 1962: 726 [**New state record**](RLZC)

Type. ANIC

Distribution. E (Alameda, Contra Costa)

Host/habitat. *Cardiaspina fiscella*, *Glycaspis* sp.

Remarks. I collected a single male that appeared referable to this species, from low roadside vegetation near a *Eucalyptus camaldulensis* heavily infested with *Glycaspis brimblecombei* in Oakland in June 2015. A month later, I found a number of males on several tree species at the peak of Mt. Diablo, about 27 kilometers east of the Oakland site. This species was never intentionally imported into California and presumably was accidentally introduced along with the tree and the psyllid, which, if proved, would be a new host record. This species is known only from males, but I collected a series of undetermined females from the *E. camaldulensis* that I suspect are conspecific.

pachypsyllae (Howard 1885: 15) (*Encyrtus*)

Type. USNM

Distribution. N (Imperial, San Bernardino)

Host/habitat. *Pachypsylla celtidisgemma*, *P. celtidisvesicula*, *P. venusta*, *Trioza beameri*

parvus Riek 1962: 749

Type. ANIC

Distribution. E (Orange, Riverside, San Bernardino, San Diego)

Host/habitat. *Eucalyptolyma maideni, Spondyliaspis* sp.

Remarks. This species had been imported from Australia in a biocontrol project against *E. maideni*, but before it was released it was found to have already been adventitiously established (Jones *et al.* 2011).

perplexus Riek 1962: 750

Type. ANIC

Distribution. E (Orange, Riverside, San Bernardino, San Diego)

Host/habitat. *Cryptoneossa triangula, Eucalyptolyma* sp.

Remarks. Jones *et al.* (2011) reported this species (mistakenly as *Psyllaephagus perplexans* Cockerell) has established in California adventitiously.

pilosus Noyes 1988b: 105

Type. NZAC

Distribution. E (Contra Costa, Los Angeles, Monterey, Orange, San Diego, San Joaquin, San Luis Obispo, Santa Clara, San Mateo, Sacramento, Sonoma, Ventura)

Host/habitat. *Ctenarytaina eucalypti*; **NEW**: *C. spatulata* (UCDC)

Remarks. Imported from New Zealand and Australia in a biocontrol program against *Ctenarytaina eucalypti*, this species was released in several sites in California in 1993, and immediately established (Dahlsten *et al.* 1998).

spp.

Remarks. In addition those species listed above, I have seen specimens that appear to represent an additional 15 morphospecies present in the state (CSCA, EMEC, RLZC, UCDC, UCFC, UCRC).

***Rhytidothorax* Ashmead 1900 [New state record]**

spp.

Remarks. A specimen that appears to represent an undescribed species of this genus was collected on *Adenostoma fasciculatum* in Solano County (UCDC).

***Saera* Noyes & Woolley 1994 [New state record]**

leuce Noyes & Woolley 1994: 1365 [**New state record**] (UCRC)

Type. BMNH

Distribution. N (Inyo, Riverside, San Bernardino)

Host/habitat. Unknown

spp.

Remarks. Specimens that appear to represent two undescribed species were collected in Imperial, Solano and Stanislaus counties (RLZC, UCDC, UCRC).

***Sectiliclava* Hoffer 1957 [New state record]**

Hosts. Hemiptera: Psyllidae

sp.

Remarks. This genus has an interesting disjunct distribution: one species (*S. cleone*) from the Palearctic, and two others (*S. isis* Noyes & Hanson 1996 and *S. pulchriceps* Noyes & Hanson, 1996) from the Neotropics (Noyes 2001). Noyes *et al.* (1997) reported an unidentified species, probably *S. cleone*, from the Nearctic, representing the first record of the genus from this region. Specimens that are close to *S. cleone* have been collected from psyllid-infested *Cercocarpus betuloides* and *Salix* ?*lasiolepis* in Contra Costa, El Dorado, Kern, Marin, Mono, Napa, Nevada, Stanislaus and Tuolumne counties (EMEC, RLZC, UCDC), as well as Arizona (RLZC) and Canada (CAS). One specimen from Alberta was collected in 1928, indicating the presence of the genus in North America is not the result of a recent introduction.

***Stemmatosteres* Timberlake 1918**

Hosts. Hemiptera: Pseudococcidae

apterus Timberlake 1918: 354

Type. USNM

Distribution. W (Alameda, Contra Costa, Fresno, Inyo, San Bernardino, San Mateo)

Host/habitat. *Dysmicoccus timberlakei*, *Phenacoccus* sp.

***Syrphophagus* Ashmead 1900**

Hosts. Diptera: Chamaemyiidae, Syrphidae; Hyperparasitoids on Hemiptera: Aphalaridae, Aphididae, Psyllidae via Hymenoptera: Aphelinidae, Braconidae, Encyrtidae, Figitidae

aphidivorus (Mayr 1876: 712–713, 724) (*Encyrtus*)

Type. NMW

Distribution. W (Alameda, Alpine, Butte, Contra Costa, El Dorado, Fresno, Imperial, Inyo, Kern, Kings,

Lassen, Los Angeles, Marin, Merced, Modoc, Monterey, Napa, Nevada, Orange, Riverside, San Benito, San Bernardino, San Diego, San Joaquin, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Sonoma, Stanislaus, Tehama, Ventura, Yolo, Yuba)

Host/habitat. As a hyperparasitoid: *Acyrthosiphon gossypii*, *A. malvae*, *A. pisum*, *Aphis craccivora*, *A. cytisorum*, *A. fabae*, *A. gossypii*, *A. medicaginis*, *A. pomi*, *Aulacorthum solani*, *Brachycaudus persicae*, *Brevicoryne brassicae*, *Cavariella aquatica*, *Diuraphis frequens*, *D. noxia*, *Eucallipterus tiliae*, *Hysteroneura setariae*, *Illinoia liriodendri*, *Myzocallis coryli*, *Myzus cerasi*, *M. persicae*, *Nearctaphis bakeri*, *Periphyllus aceris*, *Pterochlorides persicae*, *Rhopalosiphoninus solani*, *Rhopalosiphum maidis*, *R. padi*, *Sanbornia juniperi*, *Schizaphis gramimum*, *Sitobion avenae*, *Therioaphis trifolii*, *Toxoptera aurantii*, *Uroleucon compositae* via *Aphelinus asychis*, *A. jucundus*, *A. maidis*, *A. mali*, *A. sanborniae*, *A. semiflavus*, *A. varipes*, *A.* sp., *Aphidius avenae*, *A. ervi*, *A. smithi*, *A. sonchi*, *A.* sp. *Binodoxys communis*, *B. indicus*, *Diaeretiella rapae*, *Ephedrus lacertosus*, *E. persicae*, *Lysiphlebus dissolutus*, *L. fabarum*, *L. testaceipes*, *Monoctonus caricis*, *Praon exsoletum*, *P. volucre*, *P.* sp., *Trioxys complanatus*, *T. curvicaudus*, *T. pallidus*; *Agonoscena pistaciae* via *Psyllaephagus pistaciae*, *Heteropsylla cubana* via *Psyllaephagus yaseeni*; as a primary parasitoid: *Leucopis obscura*, *Sphaerophoria javana*; **NEW:** *Cacopsylla pyricola* (EMEC), *Cacopsylla tenuata* (RLZC)

Remarks. The original description is founded on keys to females (page 712) and males (page 713) and a summary paragraph (page 724). This species had been placed in the genus *Aphidencyrtus* in many early papers, and typically acts as a hyperparasitoid of aphids (and rarely, psyllids) but it has also been reported as a primary parasitoid of aphidophagous Diptera. Unlike other aphid hyperparasitoids, *S. aphidivorus* has a "dual" ovipositing behavior, ovipositing into both living and dead aphids (Kanuck & Sullivan 1992). In California, this species has shown a preference for attacking aphids parasitized by *Aphelinus* species rather than those attacked by Aphidiinae (Zuparko & Dahlsten 1995). Hoffer & Starý (1970) reported it as primary parasitoid of aphids, based on its apparent ability to reproduce over several generations in the absence of another primary parasitoid, but this view is not now commonly accepted. Silvestri (1909) reported that *S. aphidivorus* oviposited into dead aphids parasitized by *Aphidius brassicae* which in turn were parasitized by *Alloxysta victrix* (*=Allotria vittrix* var. *infuscata*), and thus the encyrtid might prove to be a tertiary parasitoid, but no such evidence has since been published. The host record of *Trialeurodes vaporariorum* (Hemiptera: Aleyrodidae) cited in Gahan *et al.* (1928) is probably erroneous.

smithi Kamal 1926: 284

Type. USNM

Distribution. N (Alameda, Contra Costa, Los Angeles, Marin, Mendocino, Monterey, Napa, Orange, Riverside, San Diego, San Mateo, Santa Barbara, Sierra)

Host/habitat. *Epistrophe emarginata*, *Eupeodes nitens*, *Neocnemodon rita*, *Syrphus opinator*; **NEW**: *Xanthogramma* sp. (UCRC)

Remarks. Mitchell (1962) categorized this as a "superparasite" of the pupal stage of *N. rita*, presumably meaning a hyperparasitoid. However, it is more likely that, like other *Syrphophagus* species, it is a primary parasitoid of Syrphidae. Originally described from California, specimens of this species have been collected from Alaska and Canada as well (CAS).

spp.

Remarks. Specimens that appear to represent an additional ten morphospecies have been collected in Alameda, Contra Costa, El Dorado, Imperial, Los Angeles, Marin, Modoc, Napa, Nevada, Placer, Riverside, San Benito, San Bernardino, Solano, Sonoma, Stanislaus and Tuolumne counties (CSCA, CAS, EMEC, RLZC, SBMN, UCDC, UCFC, UCRC).

Tachardiobius Timberlake 1926

Hosts. Hemiptera: Kerriidae

nigricans Timberlake 1926: 22

Type. USNM

Distribution. N (Imperial, Riverside)
Host/habitat. *Tachardiella larreae*, *T.* sp.

vladimiri S. Triapitsyn 2008
Type. UCRC
Distribution. N (Riverside)
Host/habitat. *Tachardiella larreae, T.* sp.

Tachinaephagus Ashmead 1904

Hosts. Diptera: Calliphoridae, Fanniidae, Muscidae, Sarcophagidae, Stratiomyiidae, Ulidiidae

zealandicus Ashmead 1904: 304
Type. USNM
Distribution. E (Alameda, Contra Costa, El Dorado, Los Angeles, Marin, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Santa Barbara, Santa Clara, Santa Cruz)
Host/habitat. *Bercaea cruentata*, *Calliphora augur*, *Calliphora quadrimaculata*, *Calliphora stygia*, *Calliphora vicina*, *Chrysomya cloropyga*, *Chrysomya megacephala*, *Chrysomya rufifacies*, *Chrysomya varipes*, *Chrysomya* sp., *Fannia canicularis*, *Haematobia exigua*, *Oxysarcodexia varia*, *Phaenicia sericata*, *Lucilia cuprina*, *Lucilia* sp., *Microchrysa* sp., *Musca domestica*, *Musca sorbens*, *Musca* sp., *Muscina stabulans*, *Muscina* sp., *Protocalliphora* sp., *Sarcophaga aurifrons*, *Sarcophaga impatiens*, *Sarcophaga* sp., *Stomoxys calcitrans*, *Tritoxa flexa*
Remarks. This species was imported from Australia in a biological control program against several species, including *Phaenicia sericata*, *Musca domestica*, *Stomoxys calcitrans* and *Fannia canicularis* in the 1960s (Legner 1978). *Bercaea haemorroidalis*, noted as a host in Noyes (2001), is a junior synonym of *B. cruentata*.

Tineophoctonus Ashmead 1900

Hosts. Coleoptera: Anobiidae

hubbardii (Ashmead 1900: 380) (*Cerchysius*)
Type. USNM
Distribution. N (Imperial)
Host/habitat. *Vrilletta hubbardi* [nomen nudum]

Trechnites Thomson 1876

Hosts. Hemiptera: Psyllidae

insidiosus (Crawford 1910: 89) (*Psylledontus*)
Type. USNM
Distribution. W (Alameda, Butte, Contra Costa, Inyo, Los Angeles, Marin, Mendocino, Mono, Napa, Orange, Placer, Riverside, San Bernardino, San Diego, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sonoma, Stanislaus, Tulare, Ventura)
Host/habitat. *Cacopsylla pyri*, *C. pyricola*, *C. vasiljevi*, *Psylla pyrisuga*, *P.* sp.
Remarks. *Trechnites insidiosus* was described in 1910 in New York, and at the time its only known host was *Cacopsylla pyricola*, an Old World species first found in the New World in 1832, and on the west coast in 1939 (Clausen 1978b). The parasitoid was first recorded on the West Coast in 1962. During a biocontrol program against *C. pyricola* that ran from the 1960s to the 1980s, *T. psyllae* (Ruschka) was imported into California from

Switzerland and southeastern Europe (Unruh *et al.* 1995). Recently Guerrieri & Noyes (2009) synonymized *T. psyllae* under *T. insidiosus* (thereby increasing the host records of the latter). However it is not clear if the presence of *T. insidiosus* in California reflects the natural endemic range of a Holarctic species, if it is a Palearctic species that was introduced accidentally when *C. pyricola* expanded its range (as suggested by Unruh *et al.* 1995), or if it became established in California during the biocontrol program starting in the 1960s.

Trichomasthus Thomson 1876

Hosts. Hemiptera: Eriococcidae

coeruleus Mercet 1923: 49

Type. MNMS

Distribution. E (Alameda, San Joaquin)

Host/habitat. *Eriococcus spurius*

Remarks. In 1939 and 1949–50 a species then identified as *T. cyanifrons* was imported from Europe and released in southern California in a biocontrol program against *E. spurius*, but failed to establish (Flanders 1952; Bartlett 1978b, cited by Noyes 2010). However, subsequent importations of a species initially identified as *T. cyanifrons* in 1952–1954 in central and northern California did result in establishment—this imported agent was later determined to be *T. coeruleus* (Dreistadt & Hagen 1994). Noyes (2001) lists two hosts for this species—both of which are invalid names for *E. spurius*.

spp.

Remarks. Specimens representing four additional morphospecies were collected from Alameda, Contra Costa, Imperial, Lassen, Marin, Orange and Tuolumne counties (RLZC, UCDC, UCFC, UCRC).

Trjapitzinellus Viggiani 1967

Hosts. Neuroptera: Coniopterygidae

microrphanos Gordh 1973: 51

Type. SEMC

Distribution. C (Alameda, Calaveras, Lassen, Marin, Orange, Plumas, Riverside, San Bernardino, San Diego, San Mateo, Santa Barbara, Solano, Stanislaus, Tuolumne, Ventura, Yolo)

Host/habitat. *Conwentzia* sp., *Parasemidalis* sp.; **NEW**: *Conwentzia barretti* (EMEC)

Remarks. In southern California, the hosts of this species are likely to be *Conwentzia nigrans* Carpenter and *Parasemidalis flaviceps* Banks, which were the most abundant coniopterygids found in association with *T. microrphanos* (Gordh 1973). In northern California, there are two instances (EMEC) where a *T. microrphanos* adult was reared from the same host (*C. barretti*) specimen as a *Dendrocerus* sp. (Hymenoptera: Megaspilidae), representing the extremely rare phenonomon of multiple parasitism. An undetermined species of this genus has been collected from Lassen and Santa Barbara counties (UCRC).

Tyndarichus Howard 1910

Hosts. Hyperparasitoids of Lepidoptera: Noctuidae via Hymenoptera: Encyrtidae

americanus Gordh & Trjapitzin 1981: 45 [**New state record**]

Type. USNM

Distribution. N (Alameda, Alpine, Contra Costa, El Dorado, Fresno, Lassen, Los Angeles, Modoc, Nevada, Orange, Plumas, San Bernardino, Tuolumne)

Host/habitat. NEW: Hyperparasitoid of *Agrotis ipsilon* via *Copidosoma celaenae* (EMEC)

Remarks. Gordh (1979: 937) reported "an undetermined species" that ranged from Wisconsin to Montana, south to Nebraska, and in Florida and California. But in the original description of *T. americanus*, Gordh & Trjapitzin (1981) noted that the type series was based on only six specimens from Wisconsin and Utah, which leaves in doubt the identity of most of the other specimens Gordh mentioned in the earlier work. At the time of the original description males were unknown, but several male specimens from Los Angeles, Nevada and Plumas counties (UCDC, UCRC) have the same collecting data as female *T. americanus*, and are presumably conspecific.

spp.

Remarks. Specimens representing an undescribed species were collected from Alameda, Contra Costa, Humboldt, Lassen, Los Angeles, Nevada, Orange and Tulare counties (CAS, CSCA, LACM, RLZC, UCDC).

Zaomma Ashmead 1900

Hosts. Hyperparasitoid of Hemiptera: Asterolecaniidae, Conchaspididae, Diaspididae, Eriococcidae via Hymenoptera: Aphelinidae, Encyrtidae

lambinus (Walker 1838: 422) (*Encyrtus*)

Type. BMNH

Distribution. W (Alameda, Alpine, Calaveras, Contra Costa, Lassen, Marin, San Bernardino, San Diego, Santa Clara, Stanislaus, Trinity, Yuba)

Host/habitat. Hyperparasitoid of *Acutaspis paulista*, *Aspidiotus destructor*, *A. nerii*, *Asterodiaspis variolosa*, *Asterolecanium* sp., *Aulacaspis difficilis*, *A. rosae*, *Chionaspis alnus*, *C. salicis*, *Chrysomphalus aonidum*, *C.* sp., *Diaspidiotus juglansregiae, D. marani*, *D. ostreaeformis*, *D. perniciosus*, *D. prunorum*, *D. pyri*, *D. zonatus*, *Dynaspidiotus abietis*, *Eriococcus spurius*, *Lepidosaphes conchiformis*, *L. malicola*, *L. tubulorum*, *L. ulmi*, *Mesolecanium nigrofasciatum*, *Phyllostroma myrtilli*, *Pseudaulacaspis pentagona*, via *Aphytis mytilaspidis*, *Encarsia berlesei*, *Pseudhomalopoda prima*, *Thomsonica amathus*

Remarks. Although Graham (1969) synonymized *Chiloneurus microphagus* Mayr, 1876 with *Z. lambinus* (under *Apterencyrtus*), Gordh (1979) continued to use the former name in the interest of stability.

spp.

Remarks. A single specimen that represents another species was swept from *Baccharis pilularis* (Asteraceae) in San Mateo County (RLZC).

Tetracneminae

Aenasius Walker 1846

Hosts. Hemiptera: Pseudococcidae

arizonensis (Girault 1915b: 280) (*Chalcaspis*)

Type. USNM

Distribution. N (Imperial, Los Angeles, Riverside, San Bernardino, Santa Clara, Tulare)

Host/habitat. *Phenacoccus solenopsis*

flandersi Kerrich 1967: 204

Type. USNM

Distribution. W (San Diego)

Host/habitat. *Ferrisia virgata, Phenacoccus gossypii*, *P. herreni*, *P. madeirensis*

maplei Compere 1937: 397

Type. USNM

Distribution. W (Ventura)

Host/habitat. *Puto yuccae*

Remarks. Noyes (2001) cites Compere (1937) in reporting *A*. *maplei* from Brazil, when in fact, Compere (pp. 390, 397–398) records this species only from California. The erroneous mention of Brazil for *A*. *maplei* probably stems from the next species treated by Compere, *A*. *brasiliensis* (Mercet) (pg. 398).

phenacocci (Ashmead 1902: 301) (*Blepyrus*)

Type. USNM

Distribution. N (Colusa, Imperial, Los Angeles, Riverside, San Bernardino, San Joaquin, Ventura)

Host/habitat. *Phenacoccus solani*, *P. solenopsis*

Remarks. *Formicococcus njalensis* is not a proven host (see Methods). A series of specimens from Riverside County identified as *A*. sp. nr. *phenacocci* was reared from *Heliococcus atriplicis* (UCRC).

spp.

Remarks. Specimens which may represent one or more undescribed species have been collected from Alameda, Calaveras, Contra Costa, Inyo, Lake, Lassen, Los Angeles, Marin, Mendocino, Mono, Monterey, Orange, Placer, Riverside, San Benito, San Bernardino, San Diego, San Mateo, San Francisco, Santa Barbara, Santa Clara, Stanislaus, Siskiyou, Tehama, Tulare and Ventura counties (CSCA, EMEC, LACM, RLZC, SBMN, UCFC, USNM).

Anagyrus Howard [in Howard & Ashmead] 1896

Hosts. Hemiptera: Pseudococcidae

californicus (Compere 1947: 19) (*Apoanagyrus*)

Type. USNM

Distribution. W (Alpine, Amador, Calaveras, Contra Costa, Fresno, Inyo, Glenn, Inyo, Lassen, Los Angeles, Riverside, San Bernardino, San Joaquin, San Luis Obispo, Solano, Stanislaus)

Host/habitat. *Phenacoccus solani*, *P.* sp.; **NEW**: *Ferrisia virgata*, *Phenacoccus gossypii* (EMEC, UCRC)

Remarks. Noyes (2000) mistakenly reported the holotype was in the collection of the University of California, Riverside. I have seen specimens from throughout the state that are near to *A*. *californicus* but have narrower frontovertex widths and a wide variation in the color of the flagellum. I have provisionally treated these as *A*. *californicus*, but recognize that they may represent additional undescribed species.

clauseni Timberlake 1924: 226

Type. UCRC

Distribution. W (Fresno, San Joaquin, Santa Clara)

Host/habitat. *Pseudococcus maritimus*

Remarks. This species was described on the basis of a single specimen, that was in good condition except for the absence of one flagellum; in the original description, Timberlake (1924: 223) noted his intention of depositing the type in the USNM. However, there is no record of the type at the USNM (M. Gates, in litt.), but, as reported by Noyes (2000: 123), a slide mounted antenna and forewing from the holotype are deposited at UCRC. According to the literature, this species has a disjunct distribution, reported only from California (Compere 1947) and Chile (De Santis 1989). Noyes (2000) noted that this species might be synonymous with *A*. *putonophilus*, which also has a disjunct New World distribution (California and Costa Rica).

dzhanokmenae Trjapitzin, Myartseva & Ruiz 2001: 413

Type. USNM

Distribution. N (Contra Costa, Kern, Los Angeles, Riverside, San Diego, San Luis Obispo)

Host/habitat. Unknown

Remarks. A small series of specimens from Inyo County (UCDC) appear to be near to this species.

kamali Moursi 1948: 1

Type. USNM

Distribution. E (Imperial)

Host/habitat. *Ferrisia virgata*, *F.* sp., *Maconellicoccus hirsutus*, *Nipaecoccus viridis*, *N*. sp., *Pseudococcus* sp., *Trabutina serpentinus*

Remarks. Along with *Gyranusoidea indica*, this species was imported in a biocontrol program against *M. hirsutus* (Roltsch *et al.* 2006). Releases took place in Imperial County from 1999 through 2002, and included material originating from China, Hawaii and Egypt, and it established as the dominant parasitoid against the mealybug. Shafee *et al.* (1975) reported *Formicococcus* (=*Planococcus*) *robustus* as a host for *A*. *flavus* Agarwal 1965 (later amended to *A*. *flavidus* after Agarwal recognized his original name was a junior homonym of *A*. *flavus* Ishii, 1928), which is a junior synonym of *A*. *kamali*. However, Noyes & Hayat (1994) noted that specimens of that species in the USNM determined by Shafee *et al.* are actually *A*. *chrysos* Noyes & Hayat, 1994, thus bringing that host record into question.

nigritus (Howard 1898a: 243) (*Aphycus*)

Type. USNM

Distribution. C (Los Angeles)

Host/habitat. Undetermined pseudococcid on *Artemisia* sp.

Remarks. In the original description, this species was reported from a "*Dactylopius* sp." At that time, many mealybugs were placed in *Dactylopius*, but that genus is now restricted to cochineal scales, placed in the family Dactylopiidae.

paralia Noyes & Menezes, in Noyes 2000:39 [**New state record**] CSCA, UCRC

Type. INBio

Distribution. W (Imperial, Los Angeles, Riverside, San Diego)

Host/habitat. Unknown

Remarks. This species was previously known only from Arizona, Texas, Mexico and Costa Rica.

sp. nr. *pseudococci* (Girault 1915c) (*Epidinocarsis*).

Remarks. The confusion surrounding the identity of this species rivals that of *Copidosoma floridanum*/*C. truncatellum*. *Anagyrus pseudococci* was described from specimens collected in Sicily, and a species identified as such was introduced into California from Brazil in biocontrol programs against *Planococcus citri* in 1934 (Bartlett & Lloyd 1958), and *Pseudococcus longispinus* in 1953 (Bartlett 1978c). In 1955, a species identified as *A*. sp. nr. *pseudococci* was imported from Italy against a suite of citrus mealybugs (Bartlett & Lloyd 1958). Evidently the 1934 attempt failed, but the species established after the later efforts. However, recent research indicated that at least two genetically and reproductively distinct taxa are involved: the "true" *A*. *pseudococci* (native to the Mediterranean area and probably accidentally established in South America), and another taxon referred to as *Anagyrus* sp. nr. *pseudococci*, which is native to the Palearctic region, but has been introduced across the globe (as *A*. *pseudococci*) in a series of biological control programs (Triapitsyn *et al.* 2007). It is this second taxon that has become established in California, reported from Fresno, Orange, Riverside and Ventura Counties on *Planococcus citri* and *P. ficus* (Triapitsyn *et al.* 2007), and from San Luis Obispo County on *Pseudococcus longispinus* and *P. viburni* (Daane *et al.* 2008). Trjapitzin (1989: 136) synonymized *A*. *kivuensis* Compere 1939 under *A*. *pseudococci*, a taxon that Triapitsyn *et al.* (2007: 18) treated as *A*. sp. nr. *pseudococci*.

putonophilus Compere 1947: 22

Type. UCRC

Distribution. W (Marin, Ventura)

Host/habitat. *Puto ambiguous*, *P. yuccae*

Remarks. See remarks under *A. clauseni*. Compere (1947) reported his intention to deposit new types described in that paper in the US National Museum, but he evidently failed to do so. Compere's syntype series is at U.C. Riverside, and Noyes (2000) designated a lectotype from that material.

smithi Doutt 1952: 401

Type. CAS

Distribution. C (Alameda, Contra Costa, Fresno)

Host/habitat. *Spilococcus implicatus*

Remarks. I designated a female specimen as lectotype (Zuparko 2009).

yuccae (Coquillet 1890: 44) (*Blastothrix*)

Type. USNM

Distribution. C (Fresno, Los Angeles, San Bernardino, San Diego)

Host/habitat. *Anisococcus crawii*, *Pseudococcus maritimus*, *Puto yuccae*; **NEW**: *Amonostherium lichtensioides*, *Puto simmondsiae* (both UCRC)

Remarks. Compere (1947) synonymized *Anagyrus ferrisi* Compere 1926 under *Anagyrus* (=*Epidinocarsus*) *subalbicornis* (Girault 1916), and noted that the latter was very near to *A. yuccae*, but maintained them as different species. However Gahan (1949) later synonymized *A. subalbicornis* under *A. yuccae*. The record of *Achrysopophagus* (=*Prochiloneurus*) *modestus* as a host in Peck (1951: 476) probably stems from a misreading of Clausen (1924), who records that species as a hyperparasitoid of *P. maritimus* via *A. subalbicornis*).

spp.

Remarks. In addition to the species listed above, I have seen specimens that appear to represent an additional 35 morphospecies present in the state (CSCA, EMEC, RLZC, SBMN, UCDC, UCFC).

Anusioptera Brues 1910 [New state record]

Hosts. Hemiptera: Pseudococcidae

koebeli Trjapitzin 1997: 668 [**New state record**](UCDC)

Type. BMNH

Distribution. W (Imperial)

Host/habitat. Unknown

Remarks. The single specimen from California varies slightly from the original description in regard to the dimensions of the syntergite and color, but Trjapitzin (1997) noted a fair degree of variation between specimens from southern Mexico and the USA, and so I feel confident assigning this specimen to the species. The only other species in the genus, *A. aureocincta* Brues, 1910, was imported into California (as "undescribed genus near *Leptomastix*") for control of *Ferrisia virgata*, but died out in culture (DeBach & Warner 1969). However, I have seen a single specimen of that species from Baja California (UCRC), and it seems likely that it will eventually be found in California as well.

Avernes Noyes & Woolley 1994 [New state record]

gela Noyes &Woolley 1994: 1379 [**New state record**](CAS)

Type. CNC

Distribution. W (San Diego)

Host/habitat. Unknown

Blepyrus Howard 1898a

Hosts. Hemiptera: Pseudococcidae

tenuiscapus (Kerrich 1967: 239) (*Euryrhopalus*)

Type. USNM

Distribution. C (Ventura)

Host/habitat. *Phenacoccus* sp.

Remarks. There is a short series of specimens from Kern, San Benito, San Bernardino, Santa Barbara and Solano counties (RLZC, UCDC, UCRC) that, except for their funicular segments, match *B. tenuiscapus*.

Charitopus Förster 1856

spp.

Remarks. An undescribed species was collected in Los Angeles County (UCRC). A second species that may be referrable to this genus was collected in Kern County (RLZC).

Chrysoplatycerus Ashmead 1889

Hosts. Hemiptera: Pseudococcidae

ferrisi Timberlake 1922: 6

Type. USNM

Distribution. C (Calaveras, Los Angeles, Riverside, San Diego, Santa Clara)

Host/habitat. *Anisococcus adenostomae*, *Phenacoccus gossypii*

Remarks. Hitherto known only from southern California, specimens from Calaveras and Santa Clara counties (RLZC) shows this species reaches well into northern California.

splendens (Howard 1888: 194) (*Rileya*)

Type. USNM

Distribution. W (Alameda, Contra Costa, Los Angeles, Marin, Orange, Riverside, San Bernardino, San Diego, San Mateo, Santa Barbara, Santa Clara, Ventura, Yolo, Yuba)

Host/habitat. *Dysmicoccus brevipes*, *D. ryani*, *Ferrisia virgata*, *Planococcus citri*, *P. ficus*, *Pseudococcus calceolariae*, *P. comstocki*, *P. longispinus*, *P. maritimus*, *P. viburni*

Remarks. Although this species was described from specimens collected in Los Angeles County in 1888, Essig (1911) stated that it "appears to be the same as one of the three introduced [into California] from the Philippine Islands by Compere." Presumably, based on this observation Clausen (1915) reported that *C. splendens* had been "placed" in San Diego County following its introduction. However, Noyes (2000: 215) thought it probable that Essig misapplied this name to a species from the genus *Taftia*, which occurs in the Philippines and closely resemble the genus *Chrysoplatycerus*. *Formicococcus njalensis* is not a proven host (see Methods).

Coccidoxenoides Girault 1915a

Hosts. Hemiptera: Pseudococcidae

perminutus Girault 1915a: 173

Type. QM

Distribution. E (Los Angeles, Riverside, San Luis Obispo, Ventura)

Host/habitat. *Delottococcus quaesitus*, *Ferrisia virgata*, ?*Phenacoccus maderiensis*, *Planococcus citri*, *P. ficus*, *P. kenyae*, *P. lilacinus*, *P.* sp. nr. *ficus*, *P. vovae*, *Pseudococcus bingervillensis, P. longispinus*, *P. njalensis*, *P. maritimus, Spilococcus* sp.; **NEW**: *Pseudococcus cryptus* [UCRC]

Remarks. Initially imported from Hawaii in an unsuccessful biocontrol program against *P. citri* (*as Pauridia peregrina* Timberlake 1919b), this species later established from material imported from China in 1950 (Bartlett 1978c). Another strain was recently imported from South Africa and released in the central coastal area (Daane *et al.* 2008). The host record of *Planococcus krauhniae* in reports from the early 20th century represents a misidentification of *P. citri* (Bartlett 1978c). Two specimens (UCRC) are recorded from *Aonidiella aurantii* on Valencia oranges from Riverside County, but this record needs to be confirmed.

Dicarnosis Mercet 1921

Hosts. Hemiptera: Pseudococcidae

ripariensis Kerrich 1978: 117
Type. USNM
Distribution. N (Alameda, Fresno, Monterey, Riverside)
Host/habitat. *Phenacoccus gossypii*

spp.
Remarks. I collected a series of specimens representing an undetermined species in Kern County (RLZC).

Ectromatopsis Compere 1947

Hosts. Hemiptera: Pseudococcidae

americana (Howard 1898a: 248) (*Ectroma*)
Type. USNM
Distribution. N (Imperial, Inyo, Kern, Riverside, San Bernardino, San Diego, Santa Barbara)
Host/habitat. *Phenacoccus solani*

Ericydnus Haliday [in Curtis] 1832
Hosts. Hemiptera: Pseudococcidae

lamasi (Domenichini 1951: 171) (*Grandoriella*)
Type. BMNH
Distribution. W (Riverside, San Bernardino, Santa Barbara)
Host/habitat. *Phenacoccus gossypii*, *Phenacoccus* sp., *Planococcus citri*, *P. maritimus*, *P. neomaritimus*
Remarks. This species was originally reported from the USA by Kerrich's (1967) reference to specimens from "California, Fillmore". However, these were laboratory reared from the insectary of the Fillmore Protection District, and it is unknown if they had been collected locally or imported. This species is known to occur from Peru north to at least Mexico (Noyes 2015), and specimens referrable to *lamasi* (CAS, EMEC, SBMN, UCRC) have been widely collected in southern California, so it appears likely that the species occurs here naturally. Noyes & Hayat (1994) reported *Pseudococcus elisae* Borchensius as a host, citing De Santis (1983), but in fact the latter paper does not link these two species.

sipylus (Walker 1837: 445)
Type. BMNH
Distribution. A (Los Angeles, San Bernardino)
Host/habitat. *Brevennia pulveraria*
Remarks. Kerrich (1967) reported a specimen of this species reared from "*Heterococcus pulverarius*

(Newstead)", which is now placed in the genus *Brevennia*. However, Miller (1975) noted that some mealybugs identified as *H. pulverarius* were actually *H. nudus* (Green), so the exact host still needs to be confirmed. Except for the California records reported in Kerrich (1967), this species appears to be restricted to the western Palaearctic, so I'm treating this species as an accidental introduction into the state.

spp.

Remarks. Specimens that appear to represent two undescribed species (both with macropterous and brachypterous forms) have been collected from Alameda, Contra Costa, Lassen, Los Angeles, Modoc, Napa, Riverside, San Bernardino, Shasta, Sierra, Solano, Stanislaus and Tuolumne counties (CAS, EMEC, RLZC, SBMN, UCFC, UCRC).

Gyranusoidea Compere 1947

Hosts. Hemiptera: Pseudococcidae

advena Beardsley 1969: 303 [**New state record**] (RLZC)

Type. BPBM

Distribution. A (Alameda)

Host/habitat. *Pseudococcus antricolens*, *P. longispinus*, *P. pipturicolus*, *P.* sp.; in California, it was collected on *Syzygium paniculatum* (Myrtaceae).

Remarks. Noyes (1988b) opined that this species might have been accidentally introduced into New Zealand from Hawaii (whence it had been described), while Beardsley (1969) noted this species did not appear to be closely allied to the Hawaiian anagyrine complex, and suggested that it was adventive there. Noyes (in litt.) notes that this species is also found in southern Africa and the Mediterranean region, suggesting it may be native to one of those areas.

claripennis (Timberlake 1918: 365) (*Tanaomastix*)

Type. USNM

Distribution. C (Los Angeles)

Host/habitat. *Dysmicoccus ryani*

indica Shafee, Alam & Agarwal 1975: 22

Type. ZDAMU

Distribution. E (Imperial)

Host/habitat. *Maconellicoccus hirsutus*, *Nipaecoccus viridis*, *N.* sp.

Remarks. Along with *Anagyrus kamali*, this species was imported in a biocontrol program directed against *M. hirsutus* (Roltsch *et al.* 2006). Releases of specimens originating from Egypt, Pakistan and Australia began in 1999. Although it has established in California, it appears to be outcompeted by *A. kamali*.

spp.

Remarks. In addition to the species listed above, I have seen specimens that appear to represent an additional five morphospecies collected in Alameda, Contra Costa, Imperial, Los Angeles, San Bernardino, San Luis Obispo, Stanislaus, Tulare and Tuolumne counties (RLZC, UCDC, UCFC, UCRC).

Holcencyrtus Ashmead 1900

Hosts. Hemiptera: Pseudococcidae

myrmicoides (Compere & Zinna 1955: 98) (*Acroaspidia*)

Type. BMNH

Distribution. E (San Bernardino)

Host/habitat. *Ferrisia virgata*, *Formicococcus njalensis*, *Phenacoccus madeirensis*, *Planococcus citri*, *P. calceolariae*, *P. longispinus*, *P. maritimus*

Remarks. This was one of a series of natural enemies imported into California from 1948–56 in biocontrol programs directed against economic mealybugs. This species was imported from Trinidad in 1954 and released in Ventura County the next year (Clausen 1956b), but it was considered to have failed to establish (Bartlett 1978c). However, it was collected in San Bernardino County in 1995 and 2006 (UCRC).

spp.

Remarks. At least two additional species are present in the state, one found in Inyo, Lassen, Los Angeles, Marin, Riverside and San Luis Obispo counties (CSCA, RLZC, UCRC), and the other in Lassen and Los Angeles counties (RLZC, UCRC).

Leptomastidea Mercet 1916

Hosts. Hemiptera: Pseudococcidae

abnormis (Girault 1915c: 184) (*Paraleptomastix*)

Type. USNM

Distribution. E (Fresno, Los Angeles, Riverside, San Diego, San Luis Obispo, Santa Barbara, Ventura, Yuba)

Host/habitat. *Dysmicoccus brevipes*, *D. ryani*, *Ferrisia virgata*, *Formicococcus njalensis*, *Phenacoccus gossypii*, *P.* sp., *Planococcus citri*, *P. ficus*, *P. kenyae*, *P. kraunhiae*, *P.* sp. nr. *ficus*, *P. vovae*, *Pseudococcus calceolariae*, *P. comstocki*, *P. cryptus*, *P. longispinus*, *P. maritimus*, *P. viburni*, *P.* sp. *Saccharicoccus sacchari*

Remarks. This species was established in 1914, when it was imported from Sicily in a biocontrol program against *P. citri* (Bartlett 1978c). It is now reared in commercial insectaries and continues to be used against several mealybug species. In the 1990s, additional stock was imported from the Middle East and released in Riverside County (González 1998), while further releases have been made in Fresno County.

Leptomastix Förster 1856

Hosts. Hemiptera: Pseudococcidae

dactylopii Howard 1885: 23

Type. USNM

Distribution. E (San Luis Obispo, Ventura)

Host/habitat. *Delottococcus quaesitus*, *D. proteae*, *Dysmicoccus brevipes*, *Ferrisia virgata*, *Formicococcus njalensis*, *Nipaecoccus viridis*, *Phenacoccus gossypii*, *P. hargreavesi*, *P. maderiensis*, *P. saccharifolii*, *P. solani*, *Planococcus aemulor*, *P. citri, P. ficus, P. kenyae*, *P. kraunhiae*, *P. lilacinus*, *P. minor*, *P. vovae*, *P.* sp., *Pseudococcus calceolariae*, *P. comstocki*. *P. concavocerarii*, *P. longispinus*, *P. maritimus*, *P. occiduus*, *P. viburni*, *P. sp.*; **NEW**: *Dysmicoccus ryani* (UCRC)

Remarks. This species was imported from Brazil and released in a biocontrol program against *P. citri* in southern California in 1935, but apparently established only in the central coastal area of California (Bartlett 1978c), where it was found 80 years later (Daane *et al.* 2008).

Mira Schellenberg 1803 [New state record]

mucora Schellenberg, 1803: 68 [**New state record**](CSCA, EMEC, RLZC, UCDC, UCRC)

Type. Boucek (1977) thought the type might be lost.

Distribution. A (Alameda, Amador, Contra Costa, Marin, Orange, Placer, Riverside, San Benito, San Diego, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tehama, Yolo)

Host/habitat. Collected from a variety of grasses and shrubs.

Remarks. This appears to be primarily a Palearctic species, but there is also a single previous record from Idaho (Gordh 1979) so it may have a natural holarctic **Distribution.** However, even though the species is quite distinctive and large enough to be noticed and taken by general collectors, I found no California records of this species prior to 1999. It now occurs in the coastal belt from San Diego north to Sonoma, and can be quite numerous locally, and is winter active as well. Therefore I treat the species as a relatively recent arrival in California, and I suspect it will continue to increase its range through western North America.

Neocharitopus Hayat, Alam & Agarwal 1975 [New state record]

Hosts. Hemiptera: Pseudococcidae

spp.

Remarks. An undetermined specimen of this genus was collected in San Bernardino County, while four additional specimens, questionably ascribed to this genus, were collected from San Diego County (UCRC).

Neodusmetia Kerrich 1964

Hosts. Hemiptera: Pseudococcidae

sangwani (Subba Rao 1957) (*Dusmetia*).

Type. INPC

Distribution. E (Orange)

Host/habitat. *Antonina graminis*

Remarks. This species was originally imported from India in 1959 and established in Texas in a biological control program against *Antonina graminis*, and specimens from that program were released in Imperial County (Bartlett 1978c). Noyes (2000), referring to Bartlett (1978c), stated this species was also successfully used in California; however Bartlett (1978c: 139) reported only that a small number of the species had been released in California in 1968, and its success had not yet been assessed. However, there is a specimen (UCRC) collected from Orange County in 1992, indicating that the species is at least established here.

Pseudleptomastix Girault 1915d

Hosts. Hemiptera: Pseudococcidae

squammulata Girault 1915d: 272

Type. USNM

Distribution. W (Alameda, Butte, Calaveras, Contra Costa, Fresno, Glenn, Imperial, Inyo, Kern, Lassen, Los Angeles, Riverside, San Bernardino, San Joaquin, Santa Barbara, Ventura)

Host/habitat. *Amonostherium lichtensioides*, *Pseudococcus maritimus*; **NEW**: *Spilococcus pressus*

Remarks. This species has also been reported from California under its junior synonyms *Paraleptomastix notatus* Girault 1917c and *Pseudleptomastix flatulescens* Compere 1926a. One of the distinguishing characters of this species is the all yellow fore coxae, but in a short series of specimens from Kern County (RLZC), the color varies from almost all yellow to almost all black.

spp.

Remarks. Two species of the genus (*P. squammulata* and *P. tertia* Kerrich 1982, the latter known only from the eastern seaboard) have been recorded from the United States, but I have seen specimens that appear to represent an additional five morphospecies present in the state from Kern, Imperial, Marin, Lassen, Los Angeles, Riverside,

Santa Barbara and Stanislaus counties (RLZC, UCDC, UCFC, UCRC). A single specimen (UCRC) was reared from an *Asphondylia* sp. stem gall on *Larrea tridentata*, and a series of specimens from Marin County (RLZC) appear to be associated with *Calycadenia multiglandulosa* (Asteraceae). There is another series of specimens that appear to be near to *Pseudleptomastix*, reared in association with male *Rhopus* from *Dysmicoccus timberlakei* in Alameda County (EMEC).

Rhopus Förster 1856 [New state record]

spp.

Remarks. To date, only two described species, *R. americanus* (Girault 1915e) and *R. nigroclavatus* (Ashmead 1902) have been reported from North America, although neither has yet been found in California (Noyes 2001). However, three morphospecies have been collected from *Distichlis* sp. (Poaceae) and terrestrial grasses from Alameda, Contra Costa, El Dorado, Imperial, Lassen, Marin, Placer, Santa Barbara and Solano counties (EMEC, RLZC, UCDC, UCRC), while some males have been reared from *Dysmicoccus timberlakei* in Alameda County (EMEC) (**NEW**), in association with specimens that appear to be near *Pseudleptomastix*.

Tetracnemoidea Howard 1898a

Hosts. Hemiptera: Pseudococcidae

brevicornis (Girault 1915e: 174) (*Arhopoideus*)

Type. QM

Distribution. E (Alameda, Los Angeles, Orange, Riverside, San Diego)

Host/habitat. *Pseudococcus calceolariae*, *P. longispinus*, *P. maritimus*, *P. viburni*

Remarks. Imported from Australia in 1928 in a biological control program against *Pseudococcus calceolariae*, this species was released at several sites in Southern California, and immediately established (Bartlett 1978c, as *Hungariella pretiosa*). *Pseudococcus comstocki* is not a proven host (see Methods). In California, I have found the three described species of the genus can occur sympatrically on urban shade trees.

peregrina (Compere 1939b: 59) (*Tetracnemus*)

Type. USNM

Distribution. E (Alameda, Los Angeles, Orange, Riverside, San Diego, San Luis Obispo)

Host/habitat. *Ferrisia virgata*, *Pseudococcus calceolariae*, *P. longispinus*, *P. maritimus*, *P. viburni*, *P.* sp.

Remarks. Imported from Brazil in 1934 and released in a biocontrol program against *Pseudococcus longispinus*, this species became established in southern California (Bartlett 1978c). *Dysmicoccus brevipes*, *Pseudococcus comstocki*, and *P. njalensis* are not proven hosts (see Methods). Additionally, Onillon (1988: 484) reports the use of *T. peregrina* in a partially successful biocontrol program against *Pseudococcus citriculus* in Israel, citing DeBach (1964); however DeBach (1964: 681) reported that parasitoid only in programs against *P. longispinus* in California and Bermuda. Noyes (2001), citing Wysoki et al (1989), reported *Pseudococcus* sp. as a host; however Wysoki *et al.* (1989) were referring to *P. longispinus*.

sydneyensis (Timberlake 1929: 18) (*Anarhopus*)

Type. USNM

Distribution. E (Alameda, Los Angeles, Marin, Orange, Placer, San Diego, San Mateo, Santa Barbara, Santa Clara, Ventura)

Host/habitat. *Pseudococcus calceolariae*, *P. longispinus*

Remarks. Imported from Australia in 1933 in a biocontrol program against *P. longispinus*, this species was released and established in southern California, and in conjunction with *T. peregrina* provided excellent control of the mealybug (Bartlett 1978c). *Pseudococcus comstocki* and *P. njalensis* are not proven hosts (see Methods). One specimen was reportedly reared from a *Protopulvinaria* species in Los Angeles County (UCRC), but this is probably a misidentification of the host.

spp.

Remarks. Specimens from Alameda, Fresno, Santa Barbara and Stanislaus counties (EMEC, RLZC, SBMN) represent an undescribed species, and single specimens from San Diego (UCRC) and Marin (RLZC) represent two additional species.

Tetracnemus Westwood 1837a

Hosts. Hemiptera: Pseudococcidae

tertius (Girault 1917a: 7) (*Paracalocerinus*)

Type. USNM

Distribution. N (Inyo, Los Angeles)

Host/habitat. *Eriococcus* sp.

Remarks. Eleven nominal species of this genus have been recorded from the United States, but given the absence of a recent generic revision, and the fact that several species were described from only one sex, it is likely that some of these names will prove to be synonymous.

spp.

Remarks. An additional five species (three fully winged and two brachypterous) have been collected from Contra Costa, Inyo, Lassen, Marin, San Benito, San Bernardino, Sonoma, Stanislaus and Yuba counties (CSCA, EMEC, RLZC, UCR).

Zarhopalus Ashmead 1900

Hosts. Hemiptera: Pseudococcidae

corvinus (Girault 1915e: 169) (*Anagyrella*)

Type. USNM

Distribution. C (Alameda, Fresno, Kern, Merced, Riverside, San Francisco, San Joaquin, Santa Cruz, Stanislaus, Tulare, Tuolumne, Ventura)

Host/habitat. *Pseudococcus comstocki*, *P. maritimus, P.* sp.; **NEW**: *Anisococcus crawii* (UCRC)

Remarks. Gordh (1979: 958) recorded this species from Quebec, which suggests it has a trans-Nearctic.

Distribution. However, this species was introduced into Quebec (and elsewhere in Canada) from California in a biocontrol program against *P. maritimus* in greenhouses (Burnett 1947). Burnett (1947) reported it provided good control, and thus it may have successfully established there, but I have seen no confirmed reports of this.

inquisitor (Howard 1881) (*Encyrtus*)[**New state record**] (RLZC)

Type. Lost

Distribution. W (Contra Costa, Glenn, San Benito, Santa Clara, Solano, Stanislaus)

Host/habitat. *Ferrisia virgata*, *Planococcus citri*

Remarks. Gahan (1927) synonymized *Aphidencyrtus schizoneurae* (Ashmead 1885), *A. aphidiphagus* (Ashmead 1887), *A. megourae* (Ashmead 1887), and *A. websteri* (Howard 1890) under *A. inquisitor*. In a later paper Gahan (1930) correctly placed these under *A.* (now *Syrphophagus*) *aphidivorus* (Mayr). Ashmead (1887) reported this species from a "*Lecanium* (=*Eulecanium*) sp. on pine", which was probably a misidentification of a mealybug.

sheldoni Ashmead 1900: 406

Type. USNM (lost)

Distribution. N (Imperial, Riverside, San Diego, Ventura)

Host/habitat. *Phenacoccus* sp., *Pseudococcus comstocki*, *P. longispinus*, *P. maritimus*; **NEW**: *Anisococcus crawii*, *Pseudococcus viburni* (UCRC), *Ferrisia virgata* (CSCA)

spp.

Remarks. There are series of undetermined specimens from Alameda, Butte, Imperial, Inyo, Los Angeles, Marin, Merced, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Santa Clara, Stanislaus, Tulare and Tuolumne counties, swept from *Adenostoma fasciculatum*, *Arctostaphylos* sp. and *Juniperus californicus* (CSCA, RLZC, UCDC, UCFC, UCRC).

Undetermined Genera

There are a number of specimens that I have been unable to place to genus. I have sorted them into 21 morphospecies that appear to represent 20 genera. In my collection there is a long series of specimens (35 or more) for four of these species, but the majority are represented by only 1 or 2 specimens each.

My results total 484 morphospecies present in the state. There are 208 described species (with a further 214 undetermined morphospecies) from 90 genera. There are 41 morphospecies representing an additional 21 described genera. Additionally, there are another 21 morphospecies, belonging to 20 genera that I am unable to recognize. Of the 276 undetermined morphospecies, some are undoubtedly undescribed, while others probably represent described species that haven't been previously reported from California. However, due to the paucity of keys to species for most Nearctic genera, I am currently unable to determine how many belong to each category.

Of the 111 described genera reported in this paper, 31 (28%) are new state records. Of the 208 described species, 36 (17%) are new state records. For these taxa, there are 68 new host records for the described species, and two new host records for the genera *Aphycaspis* and *Rhopus*. There is also one new host record reported for *Metaphycus maculipennis* (Timberlake), which is not present in California (see Appendix III).

Of the described species, 157 appear to be native, 43 were established in biological control programs, seven appear to have been introduced accidentally, while the origin of one is undetermined. Three described species found in California have curiously disjunct distributions, being known from only California and the Neotropics: *Cerchysiella scutellata*, *Anagyrus clauseni* and *A. putonophilus*. Since they were originally described from California specimens, the two *Anagyrus* species are presumed native here, and it remains to be seen if their occurrence in the Neotropics reflects a natural widespread distribution, or accidental introductions. The matter of *C. scutellata* is more questionable, so I'm treating its natural distribution as unknown.

Of the undescribed species, 273 are presumably native, two were introduced, and the origin of one is undetermined.

During my personal collecting, I found grassy areas to be the most productive habitat for encyrtids (the single most productive site was a grassy strip perhaps 400m long bordering Del Puerto Creek in Stanislaus County, where I collected hundreds of specimens representing 13 species in 11 genera over the course of two weeks). Hard chapparal was the second most productive habitat, particularly the woody shrubs—chamise (*Adenostoma fasciculatum*) was best source of encyrtids, while gray pine (*Pinus sabiniana*), manzanita (*Arctostaphylos* spp.) and coyote brush (*Baccharis pilularis*) yielded fewer specimens. Willow (*Salix* species) often supported a varied encyrtid fauna, but otherwise, riparian zones (and herbaceous plants and vines in general) were not particularly productive. Imported shade trees planted in urban zones, such as *Liriodendron tulipifera*, *Tilia* spp., and *Syzygium paniculatum*, occasionally had high populations of introduced Homopteran species, and proved to be good sites to rear parasitoids of aphids, psyllids and scales, particularly *Bothriothorax*, *Homalotylus*, *Isodromus*, *Metaphycus* and *Syrphophagus* species. Meadows and coastal prairie zones had a fair diversity of encyrtid species, while wetter, cooler areas were the least productive. Some plant species (*Alnus* spp., *Heteromeles arbutifolia*, *Juglans* spp., *Ulmus* spp.) were particularly depauperate of encyrtids, while California's state tree, coast redwood (*Sequoia sempervirens*) was the most disappointing—despite many attempts, I failed to collect a single encyrtid from this species. I chose to avoid sampling poison oak (*Toxicodendron diversilobum*), perhaps the most common woody shrub in California.

The vast bulk of specimens were collected during the warmer months of the year, especially from June through September. However, I collected the following 17 taxa from the period of 1 December through 28 February:

Anagyrus sp., *Blastothrix* sp., *Copidosoma celaenae*, *Eusemion longipenne*, *Forcipestricis* sp., *Lamennaisia ambigua*, *Metaphycus helvolus*, *Metaphycus* sp., *Microterys xanthopsis*, *Mira mucora*, *Pseudencyrtus* sp., *Psyllaephagus bliteus*, *Psyllaephagus* sp., *Syrphophagus aphidivorus*, *Tetracnemoidea sydneyensis*, *Trichomasthus* sp. and *Trjapitzinellus microrphanos*.

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References

Agarwal, M.M. (1965) Taxonomy of encyrtid parasites (Hymenoptera: Chalcidoidea) of Indian Coccoidea. *Acta Hymenopterologica,* 2, 37–97. [Tokyo]

Alam, S.M. (1957) Taxonomy of some encyrtid parasites (Hymenoptera, Chalcidoidea) of British scale insects. *Transactions of the Royal Entomological Society of London*, 101, 421–466.

Annecke, D.P. (1965) Records and descriptions of African Encyrtidae – 3 (Hymenoptera: Chalcidoidea). *Journal of the Entomological Society of South Africa*, 28, 217–229.

Annecke, D.P. (1967) The genera *Anicetus* Howard, 1896, *Paraceraptrocerus* Girault, 1920 and allies, with descriptions of new genera and species (Hymenoptera: Encyrtidae). *Transactions of the Royal Entomological Society of London*, 119, 99–169. http://dx.doi.org/10.1111/j.1365-2311.1967.tb00507.x

Annecke, D.P. & Mynhardt, M.J. (1972) The species of the *insidiosus*-group of *Metaphycus* Mercet in South Africa with notes on some extralimital species (Hymenoptera Encyrtidae). *Revue de Zoologie et de Botanique Africaines*, 85, 227–274.

Annecke, D.P. & Mynhardt, M.J. (1974) On the identity of *Copidosoma koehleri* Blanchard, 1940 (Hymenoptera: Encyrtidae). *Journal of the Entomological Society of Southern Africa*, 37, 31–33.

Araújo e Silva, A.G.A., Gonçalves, C.R., Galvão, D.M., Gonçalves, A.J.L., Gomes, J., Silva, M.N. & Simoni, L. (Eds.) (1968) *Insetos, hospedeiros e inimigos naturas. Parte 2 (1). Quarto catálogo dos insetos que vivem nas plantas do Brasil seus parasites e predadores.* Ministério da Agricultura, Rio de Janeiro, 622 pp. [GB, Brasil]

Ashmead, W.H. (1885) Studies on North American Chalcididae, with descriptions of new species from Florida. *Transactions of the American Entomological Society*, 12, x–xix.

Ashmead, W.H. (1887) Studies on the North American Chalcididae, with descriptions of new species, chiefly from Florida. *Transactions of the American Entomological Society*, 14, 183–203.

Ashmead, W.H. (1888) Descriptions of new Florida chalcids belonging to the sub-family Encyrtinae. *Entomologica Americana*, 4, 15–17. http://dx.doi.org/10.2307/25076489

Ashmead, W.H. (1889) A final word about the genus *Rileya*. *The Canadian Entomologist*, 21, 37–38.
http://dx.doi.org/10.4039/Ent2137b-2
Ashmead, W.H. (1894) Notes on cotton insects found in Mississippi. *Insect Life*, 7, 240–247.
Ashmead, W.H. (1900) On the genera of the chalcid-flies belonging to the subfamily Encyrtinae. *Proceedings of the United States National Museum*, 22, 323–412.
http://dx.doi.org/10.5479/si.00963801.22-1202.323
Ashmead, W.H. (1902) The hymenopterous parasites of *Phenacoccus cavalliae*, Ckll. *The Canadian Entomologist*, 34, 301–302.
http://dx.doi.org/10.4039/Ent34301-11
Ashmead, W.H. (1904) Classification of the chalcid flies or the superfamily Chalcidoidea, with descriptions of new species in the Carnegie Museum, collected in South America by Herbert H. Smith. *Memoirs of the Carnegie Museum*, 1, 225–551.
http://dx.doi.org/10.5962/bhl.title.10341
Aurivillius, C. (1888) *Arrhenophagus*, ett nytt slägte bland Encyrtiderna. *Entomologisk Tidskrift*, 9, 143–147.
Bartlett, B.R. (1978a) Coccidae. *In*: Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review*. *Agriculture Handbook 480*. Agriculture Research Service, United States Department of Agriculture, Washington, pp. 57–74.
Bartlett, B.R. (1978b) Eriococcidae. *In*: Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review*. *Agriculture Handbook 480*. Agriculture Research Service, United States Department of Agriculture, Washington, pp. 129–131.
Bartlett, B.R. (1978c) Pseudococcidae. *In*: Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review*. *Agriculture Handbook 480*. Agriculture Research Service, United States Department of Agriculture, Washington, pp. 137–170.
Bartlett, B.R. & Lagace, C.F. (1961) A new biological race of *Microterys flavus* introduced into California for the control of lecaniine coccids, with an analysis of its behavior in host selection. *Annals of the Entomological Society of America*, 54, 222–227.
http://dx.doi.org/10.1093/aesa/54.2.222
Bartlett, B.R. & Lloyd, D.C. (1958) Mealybugs attacking citrus in California – a survey of their natural enemies and the release of new parasites and predators. *Journal of Economic Entomology*, 51, 90–93.
http://dx.doi.org/10.1093/jee/51.1.90
Bartlett, B.R. & Medved, R.A. (1966) The biology and effectiveness of *Diversinervus elegans* (Encyrtidae: Hymenoptera), an imported parasite of lecaniine scale insects in California. *Annals of the Entomological Society of America*, 59, 974–976.
http://dx.doi.org/10.1093/aesa/59.5.974
Beardsley, J.W. Jr. (1969) The Anagyrina of the Hawaiian Islands (Hymenoptera: Encyrtidae) with descriptions of two new species. *Proceedings of the Hawaiian Entomological Society*, 20, 287–310.
Beardsley, J.W. Jr. (1976) A synopsis of the Encyrtidae of the Hawaiian Islands with keys to genera and species (Hymenoptera: Chalcidoidea). *Proceedings of the Hawaiian Entomological Society*, 22, 181–228.
Beardsley, J.W. Jr. & Gordh, G. (1988) A new *Parechthrodryinus* Girault, 1916 attacking *Xylococculus* Morrison, 1927 in California, with a discussion of the host relationship (Hymenoptera: Encyrtidae; Homoptera: Margarodidae). *Proceedings of the Hawaiian Entomological Society*, 28, 161–168.
Bellows, T.S. Jr. & Morse, J.G. (1988) Residual toxicity following dilute or low-volume applications used for control of California red scale (Homoptera: Diaspididae) to four beneficial species in a citrus agroecosystem. *Journal of Economic Entomology*, 81, 892–898.
http://dx.doi.org/10.1093/jee/81.3.892
Ben-Dov, Y. (2006a) ScaleNet, Coccidae. Available from: http://www.sel.barc.usda.gov/scalenet/scalenet.htm (accessed 30 April 2015)
Ben-Dov, Y. (2006b) ScaleNet, Pseudococcidae. Available from:http://www.sel.barc.usda.gov/scalenet/scalenet.htm (accessed 30 April 2015)
Ben-Dov, Y. (2006c) ScaleNet, Diaspididae. Available from:http://www.sel.barc.usda.gov/scalenet/scalenet.htm (accessed 3 May 2015)
Bennett, F.D. & Hughes, I.W. (1959) Biological control of insect pests in Bermuda. *Bulletin of Entomological Research*, 50, 423–436.
http://dx.doi.org/10.1017/S0007485300053025
Bernal, J.S., Luck, R.F. & Morse, J.G. (1999) Augmentative release trials with *Metaphycus* spp. (Hymenoptera: Encyrtidae) against citricola scale (Homoptera: Coccidae) in California's San Joaquin Valley. *Journal of Economic Entomology*, 92, 1099–1107.
http://dx.doi.org/10.1093/jee/92.5.1099
Bernal, J.S., Luck, R.F., Morse, J.G. & Drury, M.S. (2001) Seasonal and scale size relationships between citricola scale (Homoptera: Coccidae) and its parasitoid complex (Hymenoptera: Chalcidoidea) on San Joaquin Valley citrus. *Biological Control*, 20, 210–221.
http://dx.doi.org/10.1006/bcon.2000.0905
Blackburn, T. & Cameron, P. (1886) On the Hymenoptera of the Hawaiian Islands. *Memoirs of the Manchester Literary and Philosophical Society*, 3, 194–245.

Blanchard, E.E. (1940) Apuntes sobre Encirtidoes argentinos. *Anales de la Sociedad Cientifica Argentina*, 130, 106–128.
Blanchard, E.E. (1942) Parásitos de *Alabama argillacea* Hbn. en la Republica Argentia. *Anales de la Sociedad Cientifica Argentina*, 134, 94–128.
Blumberg, D. & DeBach, P. (1979) Development of *Habrolepis rouxi* Compere (Hymenoptera: Encyrtidae) in two armored scale hosts (Homoptera: Diaspididae) and parasite egg encapsulated by California red scale. *Ecological Entomology*, 4, 299–306.
http://dx.doi.org/10.1111/j.1365-2311.1979.tb00589.x
Boucek, Z. (1977) On *Hofferencyrtus* (gen. nov.), *Mira*, *Lyka* and some other European Encyrtidae (Hymenoptera). *Journal of Natural History*, 11, 137–154.
http://dx.doi.org/10.1080/00222937700770111
Brèthes, J. (1914) Description d'un nouveau *Prionomitus* de Chile. *Anales de Zoologia Aplicada*, 1, 29–30.
Brèthes, J. (1916) Hyménoptères parasites de l'Amérique meridionale. *Anales del Museo Nacional de Historia Natural de Buenos Aires*, 27, 401–430.
Brèthes, J. (1924) Quelques insects du Paraguay. *Revista Chilena de Historia Natural*, 28, 67–72.
Brown, B.V. (1993) A further chemical alternative to critical point drying for preparing small (or large) flies. *Fly Times*, 11, 10.
Brues, C.T. (1910) Some parasitic Hymenoptera from Vera Cruz, Mexico. *Bulletin of the American Museum of Natural History*, 28, 79–85.
Burks, B.D. (1958a) A recharacterization of the genus *Coelopencyrtus*, with descriptions of two new species (Hymenoptera: Encyrtidae). *Journal of the Washington Academy of Sciences*, 48, 22–26.
Burks, B.D. (1958b) Superfamily Chalcidoidea. *In* Krombein, K.V. (Ed.), *Hymenoptera of America north of Mexico Synoptic Catalog, First Supplement*. United States Department of Agriculture, Washington, pp. 62–84.
Burks, B.D. (1967) A new polyembryonic parasite of the pepper moth. *Proceedings of the Entomological Society of Washington*, 69, 53–55.
Burks, B.D. (1968) A new chalcidoid parasite of a ceratopogonid midge (Hymenoptera, Encyrtidae). *Entomological News*, 79, 236–240.
Burnett, T. (1947) Biological control of greenhouse insects in Canada. *29th Report of the Quebec Society for the Protection of Plants*, *1943–1944*, 84–86.
Caltagirone, L.E. (1966) A new *Pentalitomastix* from México. *The Pan-Pacific Entomologist,* 42, 145–151.
Caltagirone, L.E. (1985) New *Copidosomopsis* (Hymenoptera: Encyrtidae) from California, with comments on the genus. *Annals of the Entomological Society of America*, 78, 705–708.
http://dx.doi.org/10.1093/aesa/78.6.705
Cazier, M. (1964) Host plants, population density, and parasites of two species of jumping plant lice (Homoptera: Psyllidae). *The Pan-Pacific Entomologist*, 40, 67–74.
Clancy, D.W. (1946a) The insect parasites of the Chrysopidae (Neuroptera). *University of California Publications in Entomology*, 7, 403–496.
Clancy, D.W. (1946b) Natural enemies of some Arizona cotton insects. *Journal of Economic Entomology*, 39, 326–328.
http://dx.doi.org/10.1093/jee/39.3.326
Clancy, D.W. (1969) Parasitization of cabbage and alfalfa loopers in southern California. *Journal of Economic Entomology*, 62, 1078–1083.
http://dx.doi.org/10.1093/jee/62.5.1078
Clausen, C.P. (1915) Mealy bugs of citrus trees. *Bulletin*, *University of California Agricultural Experiment Station, Berkeley*, 258, 19–48.
Clausen, C.P. (1924) The parasites of *Pseudococcus maritimus* (Ehrhorn) in California (Hymenoptera, Chalcidoidea). Part II. Biological studies and life histories. *University of California Publications in Entomology*, 3, 253–293.
Clausen, C.P. (1955) Releases of recently imported insect parasites and predators in California, 1952–53. *The Pan-Pacific Entomologist*, 31, 77–79.
Clausen, C.P. (1956a) Biological control of insect pests in the continental United States. *Technical Bulletin, United States Department of Agriculture*, 1139, 1–151.
Clausen, C.P. (1956b) Releases of recently imported insect parasites and predators in California, 1954–55. *The Pan-Pacific Entomologist*, 32, 125–127.
Clausen, C.P. (1959) Releases of recently imported insect parasites and predators in California, 1956–57. *The Pan-Pacific Entomologist*, 35, 107–108.
Clausen, C.P. (Ed.) (1978a) *Introduced parasites and predators of arthropod pests and weeds: a world review*. *Agriculture Handbook 480*. Agriculture Research Service, United States Department of Agriculture, Washington, 545 pp.
Clausen, C.P. (1978b) Psyllidae. *In*: Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review. Agriculture Handbook 480*. Agriculture Research Service, United States Department of Agriculture, Washington, pp. 170.
Clausen, C.P. (1978c) Phycitidae. *In*: Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review. Agriculture Handbook 480*. Agriculture Research Service, United States Department of Agriculture, Washington, pp. 222–224.
Cock, M.J.W. (Ed.) (1985) A review of biological control of pests in the Commonwealth Caribbean and Bermuda up to 1982. *Commonwealth Institute of Biological Control*, *Technical Communication*, No. 9, 1–218. [Commonwealth Agricultural

Bureaux, Slough]
Cockerell, T.D.A. (1898) A bright red parasite of Coccidae. *The Canadian Entomologist*, 30, 276. http://dx.doi.org/10.4039/Ent30276-11
Compere, H. (1924) A preliminary report on the parasitic enemies of the citricola scale [*Coccus pseudomagnoliarum* (Kuwana)] with descriptions of two new chalcicoid parasites. *Bulletin of the Southern California Academy of Sciences*, 23, 113–122.
Compere, H. (1925) New chalcidoid (hymenopterous) parasites and hyperparasites of the black scale, *Saissetia oleae* Bernard. *University of California Publications in Entomology*, 3, 295–326.
Compere, H. (1926a) Descriptions of new coccid-inhabiting chalcidoid parasites (Hymenoptera). *University of California Publications in Entomology*, 4, 1–31.
Compere, H. (1926b) New coccid-inhabiting parasites (Encyrtidae, Hymenoptera) from Japan and California. *University of California Publications in Entomology*, 4, 33–50.
Compere, H. (1928) New coccid-inhabiting chalcidoid parasites from Africa and California. *University of California Publications in Entomology*, 4, 209–230.
Compere, H. (1931) A revision of the genus *Diversinervus* Silvestri, encyrtid parasites of coccids (Hymenoptera). *University of California Publications in Entomology*, 5, 233–245.
Compere, H. (1936a) A new species of *Habrolepis* parasitic in *Chrysomphalus aurantii*, Mask. *Bulletin of Entomological Research*, 27, 493–496. http://dx.doi.org/10.1017/S000748530005834X
Compere, H. (1936b) A new genus and species of Encyrtidae parasitic in the pineapple mealybug, *Pseudococcus brevipes* (Ckll.). *Proceedings of the Hawaiian Entomological Society*, 9, 171–174.
Compere, H. (1937) The species of *Aenasius*, encyrtid parasites of mealybugs. *Proceedings of the Hawaiian Entomological Society*, 9, 383–404.
Compere, H. (1938) A report on some miscellaneous African Encyrtidae in the British Museum. *Bulletin of Entomological Research*, 29, 315–337. http://dx.doi.org/10.1017/S000748530003563X
Compere, H. (1939a) A second report on some miscellanous African Encyrtidae in the British Museum. *Bulletin of Entomological Research*, 30, 1–26. http://dx.doi.org/10.1017/S0007485300004387
Compere, H. (1939b) Mealybugs and their natural enemies in South America. *University of California Publications in Entomology*, 7, 57–73.
Compere, H. (1939c) The enemy insects of the black scale, *Saissetia oleae* (Bern.) in South Africa. *University of California Publications in Entomology*, 7, 75–90.
Compere, H. (1940a) The African species of *Metaphycus*, Mercet. *Bulletin of Entomological Research*, 31, 7–33. http://dx.doi.org/10.1017/S0007485300004764
Compere, H. (1940b) Parasites of the black scale, *Saissetia oleae*, in Africa. *Hilgardia*, 13, 387–423.
Compere, H. (1943) A new species of *Metaphycus* parasitic on psyllids. *The Pan-Pacific Entomologist*, 19, 71–73.
Compere, H. (1947) A report on a collection of Encyrtidae with descriptions of new genera and species. *University of California Publications in Entomology*, 8, 1–24.
Compere, H. (1957) Descriptions of species of *Metaphycus* recently introduced into California and some corrections. *Bollettino del Laboratoria di Entomologia Agraria Filippo Silvestri', Portici*, 15, 221–230.
Compere, H. & Annecke, D.P. (1961) Descriptions of parasitic Hymenoptera and comments (Hymenopt.: Aphelinidae, Encyrtidae, Eulophidae). *Journal of the Entomological Society of Southern Africa*, 24, 17–71.
Compere, H. & Zinna, G. (1955) Tre nuovi generi e cinque nuove especie di Encyrtidae. *Bollettino del Laboratoria di Entomologia Agraria 'Filippo Silvestri', Portici*, 14, 94–116.
Coquillett, D.W. (1890) New coccids from California and one of their chalcid parasites. *West American Scientist*, 7, 43–45.
Craighead, F.C. (1950) Insect enemies of eastern forests. *Miscellanous Publications of the United States Department of Agriculture*, 657, 1–679. http://dx.doi.org/10.5962/bhl.title.65598
Craw, A. (1902) Horticultural Quarantine Reports. *In*: *Eighth Biennial Report of the State Board of Horticulture of the State of California for 1901-1902*. Sacramento, California, pp. 185–204.
Crawford, J.C. (1910) Three new genera and species of parasitic Hymenoptera. *Proceedings of the United States National Museum*, 38, 87–90. http://dx.doi.org/10.5479/si.00963801.38-1730.87
Crawford, J.C. (1912) Descriptions of new Hymenoptera No. 5. *Proceedings of the United States National Museum*, 43, 163–188. http://dx.doi.org/10.5479/si.00963801.43-1927.163
Curtis, J. (1832) *British Entomology. Vol. 9*. Printed for the author, London, 48 pls. [pls. 386–433]
Curtis, J. (1839) *British Entomology. Vol. 16.* Printed for the author, London, 48 pp. [pp.722–769]
Daane, K.M., Barzman, M.S., Kennett, C.E. & Caltagirone, L.E. (1991) Parasitoids of black scale in California: establishment of *Prococcophagus probus* Annecke & Mynhardt and *Coccophagus rusti* Compere (Hymenoptera: Aphelinidae) in olive orchards. *The Pan-Pacific Entomologist*, 67, 99–106.

Daane, K.M. & Caltagirone, L.E. (1999) A new species of *Metaphycus* (Hymenoptera: Encyrtidae) parasitic on *Saissetia oleae* (Olivier) (Homoptera: Coccidae). *The Pan-Pacific Entomologist*, 75, 13–17.

Daane, K.M., Sime, K.R., Dahlsten, D.L., Andrews, J.W. Jr. & Zuparko, R.L. (2005) The biology of *Psyllaephagus bliteus* (Hymenoptera: Encyrtidae), a parasitoid of the red gum lerp psyllid (Hemiptera: Psylloidea). *Biological Control*, 32, 228–235.
http://dx.doi.org/10.1016/j.biocontrol.2004.09.015

Daane, K.M., Cooper, M.L., Triapitsyn, S.V., Andrews, J.W. Jr. & Pipa, R. (2008) Parasitoids of obscure mealybug, *Pseudococcus viburni* (Signoret) (Hem.: Pseudococcidae) in California: establishment of *Pseudaphycus flavidulus* (Brèthes) (Hym.: Encyrtidae) and discussion of related parasitoid species. *Biocontrol Science and Technology*, 18, 43–57.
http://dx.doi.org/10.1080/09583150701729906

Dahlbom, A.G. (1857) Svenska Små-Ichneumonernas familjer och slügten. *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar*, 14, 289–298.

Dahlsten, D.L., Daane, K.M., Paine, T.D., Sime, K.R., Lawson, A.B., Rowney, D.L., Roltsch, W.J., Andrews, J.W. Jr., Kabashima, J.N., Shaw, D.A., Robb, K.L., Downer, J.A., Geisel, P.M., Chaney, W.E., Ingels, C.A., Varela, L.G., Bianchi, M.L. & Taylor, G. (2008) Imported parasitic wasp helps control red gum lerp psyllid. *California Agriculture*, 59, 229–234.
http://dx.doi.org/10.3733/ca.v059n04p229

Dahlsten, D.L., Rowney, D.L., Copper, W.A., Tassan, R.L., Chaney, W.E., Robb, K.L., Tjosvold, S., Bianchi, M. & Lane, P. (1998) Parasitoid wasp controls blue gum psyllid. *California Agriculture*, 52, 31–34.
http://dx.doi.org/10.3733/ca.v052n01p31

Dahlsten, D.L., Rowney, D.L., Robb, K.L., Downer, J.A., Shaw, D.A. & Kabashima, J.N. (2003) Biological control of introduced psyllids on Eucalyptus. *Proceedings of the 1st International Symposium on Biological Control of Arthropods, Honolulu, Hawaii, USA, January 14-18, 2002.* USDA Forest Service FHTET-03-05, June 2003, pp. 356–361.

Dahms, E. & Gordh, G. (1997) A review of the genera of Australian Encyrtidae (Hymenoptera: Chalcidoidea) described from Australia by A.A. Girault with a checklist of included species. *Memoirs on Entomology International*, 9, 1–518.

Dalla Torre, K.W. von (1898) *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. V. Chalcididae et Proctotrupidae*. Guilielmi Engelmann, Leipzig, 598 pp.

Dalman, J.W. (1820) Försök till Uppställning af Insect-familjen Pteromalini, I synnerhet med afseen de på de I Sverige funne Arter (Fortsättning). *Kungliga Svenska Vetenskapsakademiens Handlingar*, 41, 123–174, 177–182, 340–385.

Daly, H.V., Stage, G.I. & Brown, T. (1967) Natural enemies of bees of the genus *Ceratina* (Hymenoptera: Apoidea). *Annals of the Entomological Society of America*, 60, 1273–1282.

DeBach, P. (1964) Successes, trends, and future possibilities. *In*: DeBach, P. (Ed.), *Biological control of insect pests and weeds*. Reinhold, New York, pp. 673–713.

DeBach, P. (1977) A newly imported red scale parasite from Saudi Arabia. *California Agriculture*, 31, 6–7.

DeBach, P. & Warner, S. (1969) Importation and colonization of natural enemies of the striped mealybug, *Ferrisia virgata*, in California. *Annals of the Entomological Society of America*, 62, 1117–1119.
http://dx.doi.org/10.1093/aesa/62.5.1117

De Santis, L. (1964) Encirtidos de la Republica Argentina (Hymenoptera: Chalcidoidea). *Anales de la Comisión de Investigacion Cientifica Provincia de Buenos Aires Gobernacion*, 4, 9–422.

De Santis, L. (1972) Adiciones a la fauna Argentina de encírtidos. III. (Hymenoptera: Chalcidoidea). *Revista Peruana de Entomología*, 15, 44–60.

De Santis, L. (1979) *Catálogo de los himenópteros calcidoeos de América al Sur de los Estados Unidos*. Publicación Especial Comisión de Investigaciones Científicas Provincia de Buenos Aires, La Plata, 488 pp.

De Santis, L. (1980) *Catalogo de los Himenopteros Brasileños de la serie parasitica incluyendo Bethyloidea*. Universidade Federal do Paraná, Curitiba, 395 pp. [Brasil]

De Santis, L. (1983). Catalogo de los himenopteros calcidoideos de America al sur de Los Estados Unidos – Primer suplemento. *Revista Peruana de Entomologia*, 24, 1–38.

De Santis, L. 1989. Catalago de los himenopteros calcidoides (Hymenoptera) al sur de los Estados Unidos, Segundo suplemento. *Acta Entomologica Chilena*, 15, 9–90.

De Santis, L. & Fidalgo, P. (1994) Catalogo de Himenopteros Calcidoideos. *Serie de la*
Academia Nacional de Agronomia y Veterinara, 13, 1–145.

De Santis, L. & Monetti, N.C. (2008) Lista de Himenópteros parasitoids y depredadores de los insectos de Argentina: primer suplemento. *In*: Llorente-Bousquets, J. & Lanteri. A. (Eds.), *Contribuciones taxonómicas en órdenes de insectos hiperdiversos. III Reunión annual de la Red Iberoamericana de Biogeografía y Entomología Sistemática: La Plata, Argentina; Diciembre de 2006*. Universidad Nacional Autónoma de México, México City, pp. 91–139.

De Stefani, T. (1886) Raccolte imenotterologische sui monti di Renda e loro adjacenze. *Naturalista Siciliano*, 5, 112, 138, 168, 181–186.

Domenichini, G. (1951) Parassiti e iperparassiti di *Pseudococcus citro* Risso in Italia e nel Peru. *Bollettino di Zoologia Agraria e Bachicoltura, Milano*, 17, 157–180.

Doutt, R.L. (1951) Biological control of mealybugs infesting commercial greenhouse gardenias. *Journal of Economic Entomology*, 44, 37–40.
http://dx.doi.org/10.1093/jee/44.1.37

Doutt, R.L. (1952) Two new species of *Anagyrus* (Hymenoptera: Encyrtidae). *Proceedings of the Hawaiian Entomological*

Society, 14, 399–402.
Doutt, R.L. (1966) A taxonomic analysis of parasitic Hymenoptera reared from *Parlatoria oleae* (Colvée). *Hilgardia*, 37, 219–231.
http://dx.doi.org/10.3733/hilg.v37n09p219
Dowden, P.B. (1962) *Parasites and predators of forest insects liberated in the United States through 1960*. *Agriculture Handbook 266*. United States Department of Agriculture, Washington, 70 pp.
Dozier, H.L. (1936) Descriptions of two new encyrtid parasites of non-diaspine scales. *Proceedings of the Entomological Society of Washington*, 37, 183–185.
Dreistadt, S.H. & Hagen, K.S. (1994) European elm scale (Homoptera: Eriococcidae) abundance and parasitism in northern California. *The Pan-Pacific Entomologist*, 70, 240–252.
Embleton, A.L. (1902) On the economic importance of the parasites of the Coccidae. *Transactions of the Royal Entomological society of London*, 35, 219–229.
http://dx.doi.org/10.1111/j.1365-2311.1902.tb01382.x
Erdös, J. (1957) Enumeratio systematica Encyrtidarum (Hym.) Hungariae regionumque finitimarum cum datis earum ethologicis. *Folia Entomologica Hungarica*, 10, 1–104.
Erdös, J. & Novicky, S. (1955) Genera Encyrtidarum regionis Palearcticae. *Beiträge sur Entomologie*, 5, 165–202.
Essig, E.O. (1909) The genus *Pseudococcus* in California. *Pomona College Journal of Entomology*, 1, 35–46.
Essig, E.O. (1911) The natural enemies of the citrus mealy bug IV. *Pomona College of Journal of Entomology*, 3, 518–522.
Essig, E.O. (1914) The mealybugs of California. *California State Commission of Horticulture Monthly Bulletin*, 3, 97–143.
Essig, E.O. (1915) Injurious and beneficial insects of California. *California State Commission of Horticulture Monthly Bulletin*, 4 Supplement, 541 pp.
http://dx.doi.org/10.5962/bhl.title.36435
Essig, E.O. (1922) Insect notes from Laguna Beach, California. *Journal of Entomology and Zoology*, 14, 75–78.
Essig, E.O. (1926) *Insects of western North America*. Macmillan, New York, 1035 pp.
Ferrière, C. (1952) Les parasites de *Lyonetia clerckella*. *Transactions of the 9th International Congress of Entomology*, 1, 593–596. [Amsterdam, 1951]
Flanders, S.E. (1940a) A Brazilian parasite of *Pseudococcus maritimus* (Ehrh.). *Journal of Economic Entomology*, 33, 201.
http://dx.doi.org/10.1093/jee/33.1.201
Flanders, S.E. (1940b) Biological control of the long-tailed mealybug *Pseudococcus longispinus*. *Journal of Economic Entomology*, 33, 754–759.
http://dx.doi.org/10.1093/jee/33.5.754
Flanders, S.E. (1944) The introduction and establishment of *Habrolepis rouxi* in California. *Journal of Economic Entomology*, 37, 444–445.
http://dx.doi.org/10.1093/jee/37.3.444a
Flanders, S.E. (1952) A parasite of the European elm scale established in California. *Journal of Economic Entomology*, 45, 1078–1079.
http://dx.doi.org/10.1093/jee/45.6.1078
Fonscolombe, E.L.J.H.B. de. (1832) Monographia chalciditum galloprovinciae circa aquas degentum. *Annales des Sciences Naturelles*, Zoologie, 26, 273–307.
Förster, A. (1856) Hymenopterologische Studien. 2. Chalcidiae und Proctotrupii, Aachen, 152 pp.
Fullaway, D.T. (1913) Report of the entomologist. *Report of the Hawaiian Agricultural Experiment Station 1912*, 26–31.
Funasaki, G.Y., Lai, P.Y., Nakahara, L.M., Beardsley, J.W. & Ota, A.K. (1988) A review of biological control introductions in Hawaii: 1890-1985. *Proceedings of the Hawaiian Entomological Society*, 28, 105–160.
Gahan, A.B. (1910) Four new species of Hymenoptera. Chalcidoidea, Encyrtidae. *The Canadian Entomologist*, 42, 205–208.
http://dx.doi.org/10.4039/Ent42205-6
Gahan, A.B. (1912) Descriptions of two new genera and six new species of parasitic Hymenoptera. *Proceedings of the Entomological Society of Washington*, 14, 2–8.
Gahan, A.B. (1914) A new species of *Cheiloneurus* with a key to the described species from the United States. *Annals of the Entomological Society of America,* 7, 247–248.
http://dx.doi.org/10.1093/aesa/7.3.247
Gahan, A.B. (1927) Miscellanous descriptions of new parasitic Hymenoptera with some synonymical notes. *Proceedings of the United States National Museum*, 71, 1–39.
http://dx.doi.org/10.5479/si.00963801.71-2676.1
Gahan, A.B. (1930) Synonymical and descriptive notes on parasitic Hymenoptera. *Proceedings of the United States National Museum,* 77, 1–12.
http://dx.doi.org/10.5479/si.00963801.77-2831.1
Gahan, A.B. (1942) Descriptions of five new species of Chalcidoidea, with notes on a few described species (Hymenoptera). *Proceedings of the United States National Museum*, 92, 41–51.
http://dx.doi.org/10.5479/si.00963801.92-3137.41
Gahan, A.B. (1946) Eight new species of chalcid-flies of the genus *Pseudaphycus* Clausen, with a key to the species. *Proceedings of the United States National Museum*, 96, 311–327.
http://dx.doi.org/10.5479/si.00963801.96-3200.311

Gahan, A.B. (1949) Identity of the *Anagyrus* that parasitizes the pineapple mealybug (Hymenoptera: Chalcidoidea: Encyrtidae). *Proceedings of the Hawaiian Entomological Society*, 13, 357–360.
Gahan, A.B., Crosby, C.R. & Leonard, M.D. (1928) Superfamily Chalcidoidea. *In* Leonard, M.D. (Ed.). *A list of the insects of New York. Memoirs Cornell University Agricultural Experiment Station*, 101, pp. 975–985.
Gahan, A.B. & Waterston, J. (1926) Notes on Encyrtidae (Hym.-Chalcidoidea) bred from psyllids, with description of a new species. *Bulletin of Entomological Research*, 16, 373–375.
http://dx.doi.org/10.1017/S0007485300028698
Gates, M.W., Heraty, J.M., Schauff, M.E., Wagner, D.L., Whitfield, J.B. & Wahl, D.B. (2002) Survey of the parasitic Hymenoptera on leafminers in California. *Journal of Hymenoptera Research*, 11, 213–270.
Geoffroy, E.L. (1785) *In* Fourcroy, A.F. de (Ed.), *Entomologia Parisiensis; sive catalogus Insectorum, quae in agro Parisiensi reperiuntus; secundum methodam Geoffraeriam in sectiones, genera et species distributii; cui addita sunt nomina trivialia et fere recentae novae species, pars secunda*. Paris, pp. 233–544.
Girault, A.A. (1914) Records on new Chalcidoidea Encyrtidae from Australia. *Societas Entomologica, Frankfurt*, 29, 59–60.
Girault, A.A. (1915a) Australian Hymenoptera Chalcidoidea – VII. The family Encyrtidae with descriptions of new genera and species. *Memoirs Queensland Museum*, 4, 1–184.
Girault, A.A. (1915b) New chalcidoid Hymenoptera. *Annals of the Entomological Society of America*, 8, 279–284.
http://dx.doi.org/10.1093/aesa/8.3.279
Girault, A.A. (1915c) Four new encyrtids from Sicily and the Philippines. *Entomologist*, 48, 184–186.
Girault, A.A. (1915d) Some new chalcidoid Hymenoptera from North and South America. *Annals of the Entomological Society of America*, 8, 272–278.
http://dx.doi.org/10.1093/aesa/8.3.272
Girault, A.A. (1915e) New genera of chalcidoid Hymenoptera. *Journal of the New York Entomological Society*, 23, 165–173.
Girault, A.A. (1916) New Encyrtidae from North America. *Psyche*, 23, 41–50.
http://dx.doi.org/10.1155/1916/76065
Girault, A.A. (1917a) *Descriptiones stellarum novarum*. Private publication, Glenndale, Maryland, 22 pp.
Girault, A.A. (1917b) *Descriptiones Hymenopterorum Chalcidoidicarum variorum cum observationibus III*. Private publication, Glenndale, Maryland, 10 pp.
Girault, A.A. (1917c) Descriptiones Hymenopterorum Chalcidoidicorum cum observationibus. IV. *Entomologist*, 50, 36–38.
Girault, A.A. (1917d) *Descriptiones Hymenopterorum Chalcidoidicarum variorum cum observationibus V.* Private publication, Glenndale, Maryland, 10 pp.
Girault, A.A. (1917e) Description of miscellanous chalcid flies. *Insecutor Inscitiae Menstruus*, 4, 109–121.
Girault, A.A. (1918) The North American species of *Cerchysius*, females. *Entomological News*, 29, 65–66.
Girault, A.A. (1922) New chalcid flies from eastern Australia (Hymenoptera: Chalcididae). I. *Insecutor Inscitiae Menstruus*, 10, 39–49.
Gomes, J.G. (1942) Subsidos à sistemática a dos calcidídeos brasileiros. *Boletim da Escola Nacional de Agronomia, Rio de Janeiro*, 2, 9–45.
González, D. (1998) Biological control of the vine mealybug in the Coachella Valley. *California Table Grape Committee, Annual Report*, 26, 1–4.
Gordh, G. (1973) Description of a new species of *Trjapitzinellus* parasitic on Coniopterygidae in California. *The Pan-Pacific Entomologist*, 49, 51–55.
Gordh, G. (1979) Family Encyrtidae. *In*: Krombein, K.V., Hurd, P.D. Jr., Smith, D.R. & Burks, B.D. (Eds.), *Catalog of Hymenoptera in America North of Mexico. Vol. 1. Symphyta and Apocrita (Parasitica)*. Smithsonian Institution Press, Washington, pp. 890–967.
Gordh, G. (1985) A new species of *Paratetracnemoidea* Girault, 1915, found in North America, with a discussion of generic placement (Hymenoptera: Encyrtidae). *The Florida Entomologist*, 68, 587–594.
http://dx.doi.org/10.2307/3494860
Gordh, G. (1987) A taxonomic study of Nearctic *Meromyzobia* Ashmead, 1900 (Hymenoptera: Encyrtidae). *The Pan-Pacific Entomologist*, 63, 16–36.
Gordh, G. & Hall, J.C. (1979) A critical point drier used as a method of mounting insects from alcohol. *Entomological News*, 90, 57–59.
Gordh, G. & Trjapitzin, V.A. (1975) *Pseudencyrtoides cupressi* Gordh et Trjapitzin, gen. et sp. n., new genus and a new species of encyrtid (Hymenoptera, Chalcidoidea, Encyrtidae) from North America. *Entomologicheskoe Obozrenie*, 54, 872–876.
Gordh, G. & Trjapitzin, V.A. (1981) Taxonomic studies of the Encyrtidae with the descriptions of new species and a new genus. *University of California Publications in Entomology*, 93, 1–55.
Gowdey, C.C. (1925) Report of the government entomologist. *Annual Report of the Department of Science and Agriculture, Jamaica*, 1924, 17–20.
Graham, M.W.R. de V. (1969) Synonymic and descriptive notes on European Encyrtidae (Hym., Chalcidoidea). *Polskie Pismo Entomologiczne*, 39, 211–319.
Guerrieri, E. & Noyes, J.S. (2000) Revision of European species of genus *Metaphycus* Mercet (Hymenoptera: Chalcidoidea: Encyrtidae), parasitoids of scale insects (Homoptera: Coccoidea). *Systematic Entomology*, 25, 147–222.
http://dx.doi.org/10.1046/j.1365-3113.2000.00099.x
Guerrieri, E. & Noyes, J.S. (2005) Revision of the European species of *Copidosoma* Ratzeburg (Hymenoptera: Encyrtidae),

parasitoids of caterpillars (Lepidoptera). *Systematic Entomology*, 30, 97–174.
http://dx.doi.org/10.1111/j.1365-3113.2005.00271.x
Guerrieri, E. & Noyes, J.S. (2009) A review of the European species of the genus *Trechnites* Thomson (Hymenoptera: Chalcidoidea: Encyrtidae), parasitoids of plant lice (Hemiptera: Psylloidea) with descriptions of a new species. *Systematic Entomology*, 34, 252–259.
http://dx.doi.org/10.1111/j.1365-3113.2009.00473.x
Györfi, J. (1942) Fürkészdarázs kutatásaim eredménye, különös tekintettel a mellékgazda kérdésre. Die Ergebnisse meiner Schlupfwespenforschungen mit besonderer Berucksichtigung der Zwischenwirtfrage. *Erdészeti Kisérlatek*, 44, 89–105.
Hall, J.C. (1974) A new genus and species of mealybug parasite from Paraguay (Hymenoptera: Encyrtidae). *Entomological News*, 85, 19–20.
Hanks, L.M., Paine, T.D. & Millar, J.G. (1996) Tiny wasp helps protects eucalyptus from eucalyptus longhorned borer. *California Agriculture*, 50, 14–16.
http://dx.doi.org/10.3733/ca.v050n03p14
Hayat, M. (1981) Taxonomic notes on Indian Encyrtidae (Hymenoptera: Chalcidoidea) III. *Colemania*, 1, 13–34.
Hayat, M. (1986) Family Encyrtidae. *In* Subba Rao, B.R. & Hayat, M. (Eds.), *The Chalcidoidea (Insecta: Hymenoptera) of India and the adjacent countries. Part II. Oriental Insects*, 20, pp. 67–137.
Hayat, M. (2006) *Indian Encyrtidae (Hymenoptera: Chalcidoidea).* Department of Zoology, Aligarh Muslim University, Aligarh, 496 pp.
Hayat, M., Alam, M. & Agarwal, M.M. (1975) Taxonomic survey of encyrtid parasites (Hymenoptera: Encyrtidae) in India. *Aligarh Muslim University Publication, Zoological Series on Indian Insect Types*, 9, 1–112.
Herting, B. (1972) Homoptera. *A Catalogue of Parasites and Predators of Terrestrial Arthropods (A)*, 2, 1–210. [Commonwealth Agricultural Bureaux, Slough]
Hilburn, D.J., Marsh, P.M. & Schauff, M.E. (1990) Hymenoptera of Bermuda. *Florida Entomologist*, 73, 161–176.
http://dx.doi.org/10.2307/3495342
Hoffer, A. (1954) Encyrtidae nasich státních prírodnich reservací II. *Ochrana Prírody*, 9, 169–173.
Hoffer, A. (1957) The Czechoslovak species of the subtribe Cheiloneurii. *Acta Societatis Entomologicae Čechosloveniae*, 54, 327–355.
Hoffer, A. & Starý, P. (1970) A review of the biologies of Palearctic *Aphidencyrtus* – species (Hym., Chalcidoidea, Encyrtidae). *Studia Entomologica Forestalia*, 1, 81–96.
Howard, L.O. (1881) Report of the parasites of Coccidae in the collections of the U.S. Department of Agriculture Part III. *In*: Comstock, J.H. (Ed.), *Report of the entomologist for 1880*. United States Department of Agriculture (Entomology), Washington, pp. 350–372.
Howard, L.O. (1885) Descriptions of North American Chalcididae from the collection of the U.S. Department of Agriculture and of Dr. C.V. Riley, with biological notes. [First paper]. *Bulletin of United States Department of Agriculture, Bureau of Entomology*, 5, 1–47.
Howard, L.O. (1887) *Report of the entomologist.* Report of the United States Department of Agriculture, 1886, 488 pp.
Howard, L.O. (1888) The chalcid genus *Rileya*. *The Canadian Entomologist*, 20, 191–195.
Howard, L.O. (1889) Three new parasites of *Icerya*. *Insect Life*, 1, 268–270.
http://dx.doi.org/10.4039/Ent20191-10
Howard, L.O. (1890) Some new parasites of the grain plant louse. *Insect Life*, 2, 246–248.
Howard, L.O. (1892) Insects of the subfamily Encyrtinae with branched antennae. *Proceedings of the United States National Museum*, 15, 361–369.
http://dx.doi.org/10.5479/si.00963801.15-905.361
Howard, L.O. (1894) The hymenopterous parasites of the California red scale. *Insect Life*, 6, 227–236.
Howard, L.O. (1895a) On the bothriothoracine insects of the United States. *Proceedings of the United States National Museum*, 17, 605–613.
http://dx.doi.org/10.5479/si.00963801.1025.605
Howard, L.O. (1895b) Some shade-tree insects of Springfield and other New England cities. *Bulletin of the United States Department of Agriculture, Division of Entomology*, 2, 40–50.
Howard, L.O. (1897) On the Chalcididae of the Island of Grenada. *Journal of the Linnean Society*, Zoology, 26, 129–178.
http://dx.doi.org/10.1111/j.1096-3642.1897.tb00244.x
Howard, L.O. (1898a) On some new parasitic insects of the subfamily Encyrtinae. *Proceedings of the United States National Museum*, 21, 231–248.
http://dx.doi.org/10.5479/si.00963801.1142.231
Howard, L.O. (1898b) A new parasite of the harlequin cabbage bug. *The Canadian Entomologist*, 30, 17–18.
http://dx.doi.org/10.4039/Ent3017-1
Howard, L.O. (1906) An interesting new genus and species of Encyrtidae. *Entomological News*, 17, 121–122.
Howard, L.O. (1907) A chalcidoid parasite of a tick. *Entomological News*, 18, 375–378.
Howard, L.O. (1908) Another chalcidoid parasite of a tick. *The Canadian Entomologist*, 40, 239–241.
http://dx.doi.org/10.4039/Ent40239-7
Howard, L.O. (1910) On some parasites reared or supposed to be reared from the eggs of the gypsy moth. *Technical Series, Bureau of Entomology, United States Department of Agriculture*, 19, 1–12.

Howard, L.O. & Ashmead, W.H. (1896) On some reared parasitic hymenopterous insects from Ceylon. *Proceedings of the United States National Museum*, 18, 633–648.
http://dx.doi.org/10.5479/si.00963801.18-1092.633
Huffaker, C.B. Kennett, C.E. & Finney, G.L. (1962) Biological control of olive scale, *Parlatoria oleae* (Colvée), in California by imported *Aphytis maculicornis* (Masi) (Hymenoptera: Aphelinidae). *Hilgardia*, 32, 541–636.
http://dx.doi.org/10.3733/hilg.v32n13p541
Johansen, C.A. (1957) History of biological control of insects in Washington. *Northwest Science*, 31, 57–79.
Jones, M.E., Daane, K.M. & Paine, T.D. (2011) Establishment of *Psyllaephagus parvus* and *P. perplexans* as serendipitous biological control agents of *Eucalyptus* psyllids in southern California. *BioControl*, 56, 735–744.
http://dx.doi.org/10.1007/s10526-011-9351-0
Ishii, T. (1923) Observations on the hymenopterous parasites of *Ceroplastes rubens* Mask., with descriptions of new genera and species of the subfamily Encyrtinae. *Bulletin of Imperial Plant Quarantine Station Yokohama*, 3, 69–114.
Ishii, T. (1925) New Encyrtinae from Japan. *Technical Bulletin Imperial Plant Quarantine Service Revenue Bureau,* 3, 21–30.
Ishii, T. (1928) The Encyrtidae of Japan. I. *Bulletin of the Imperial Agricultural Experiment Station of Japan*, 3, 79–160.
Jensen, D.D. (1957) Parasites of the Psyllidae. *Hilgardia*, 27, 71–99.
http://dx.doi.org/10.3733/hilg.v27n02p071
Johansen, C.A. (1957) History of biological control of insects in Washington. *Northwest Science*, 31, 57–79.
Kamal, M. (1926) Four new species of parasites from aphidophagous Syrphidae (Hymenoptera). *The Canadian Entomologist*, 58, 283–286.
http://dx.doi.org/10.4039/Ent58283-11
Kanuck, M.J. & Sullivan, D.J. (1992) Ovipositional behavior and larval development of *Aphidencyrtus aphidivorus* (Hymenoptera: Encyrtidae), an aphid hyperparasitoid. *Journal of the New York Entomological Society*, 100, 527–532.
Kapranas, A., Morse, J.G., Pacheco, P., Forster, L.D. & Luck, R.F. (2007) Survey of brown soft scale *Coccus hesperidum* L. parasitoids in southern California citrus. *Biological Control*, 42, 288–299.
http://dx.doi.org/10.1016/j.biocontrol.2007.05.012
Kennett, C.E. (1986) A survey of the parasitoid complex attacking black scale, *Saissetia oleae* (Olivier), in central and northern California (Hymenoptera: Chalcidoidea; Homoptera: Coccidae). *The Pan-Pacific Entomologist*, 62, 363–369.
Kennett, C.E. (1988) Results of exploration for parasitoids of citricola scale, *Coccus pseudomagnoliarum* (Homoptera, Coccidae), in Japan and their introduction in California. *Kontyu*, 56, 445–457.
Kerrich, G.J. (1953) Report on Encyrtidae associated with mealybugs on cacao in Trinidad, and on some other species related thereto. *Bulletin of Entomological Research*, 44, 789–810.
http://dx.doi.org/10.1017/S0007485300024731
Kerrich, G.J. (1954) A systematic study of the Encyrtid genus *Cerchysius* Westwood (Hym., Chalcidoidea). *Annals and Magazine of Natural History*, 7, 371–379.
http://dx.doi.org/10.1080/00222935408651742
Kerrich, G.J. (1964) On the European species of *Dusmetia* Mercet, and a new oriental genus (Hym., Chalcidoidea, Encyrtidae). *Entomophaga*, 9, 75–79.
http://dx.doi.org/10.1007/BF02375742
Kerrich, G.J. (1967) On the classification of the anagyrine Encyrtidae, with a revision of some of the genera (Hymenoptera: Chalcidoidea). *Bulletin of the British Museum (Natural History)*, 20, 143–250.
Kerrich, G.J. (1978) A revision of the dinocarsiine Encyrtidae with a study of the genus *Pelmatencyrtus* De Santis (Hymenoptera: Chalcidoidea). *Zoological Journal of the Linnean Society*, 62, 109–159.
http://dx.doi.org/10.1111/j.1096-3642.1978.tb01034.x
Kerrich, G.J. (1982) Further systematic studies on Tetracneminae Encyrtidae (Hym., Chalcidoidea) including a revision of the genus *Apoanagyrus* Compere. *Journal of Natural History*, 16, 399–430.
http://dx.doi.org/10.1080/00222938200770331
Lampson, L.J. & Morse, J.G. (1992) A survey of black scale, *Saissetia oleae* [Hom.: Coccidae] parasitoids [Hym.: Chalcidoidea] in southern California. *Entomophaga*, 37, 373–390.
http://dx.doi.org/10.1007/BF02373111
Langston, R.L. (1957) A synopsis of hymenopterous parasites of *Malacosoma* in California (Lepidoptera, Lasiocampidae). *University of California Publications in Entomology*, 14, 1–50.
LaSalle, J. & Gordh, G. (1985) *Cerchysiella scutellata* from California (Hymenoptera: Chalcidoidea: Encyrtidae). *Proceedings of the Entomological Society of Washington*, 87, 675.
Latreille, P.A. (1809) *Genera Crustaceorum et Insectorum* 4. A. Koenig, Parisius & Argentorati, 399 pp.
Lawson, F.A. (1954) Observations on the biology of *Comperia merceti* (Compere) (Hymenoptera: Encyrtidae). *Journal of the Kansas Entomological Society*, 27,128–142.
Legner, E.F. (1978) Calliphoridae, Muscidae, Sarcophagidae. *In*: Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review*. *Agriculture Handbook 480.* Agriculture Research Service, United States Department of Agriculture, Washington, pp. 335–338, 346–355.
Legner, E.F. (1983) Patterns of field diapause in the navel orangeworm (Lepidoptera: Phycitidae) and three imported parasites. *Annals of the Entomological Society of America*, 76, 503–506.
http://dx.doi.org/10.1093/aesa/76.3.503

Maple, J.D. (1937) The biology of *Ooencyrtus johnsoni* (Howard), and the role of the egg shell in the respiration of certain encyrtid larvae (Hymenoptera). *Annals of the Entomological Society of America*, 30, 123–154. http://dx.doi.org/10.1093/aesa/30.1.123

Masi, L. (1917) Chalcididae of the Seychelles Islands. *Novitates Zoologicae*, 24, 121–330.

Mayr, G. (1876) Die europaïschen Encyrtiden. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien*, 25, 675–778.

McCoy, C.W. & Selhime, A.G. (1970) *Cheiloneurus inimicus* (Hymenoptera: Encyrtidae), a primary parasite of black scale in Florida. *Annals of the Entomological Society of America*, 63, 618–691. http://dx.doi.org/10.1093/aesa/63.2.618

McGregor, E.A. (1914) Some notes on parasitism of chrysopids in South Carolina. *The Canadian Entomologist*, 46, 306–308. http://dx.doi.org/10.4039/Ent46306-9

McKenzie, H.L. (1967) *Mealybugs of California*. University of California Press, Berkeley & Los Angeles, 526 pp.

Meals, D.W. & Caltagirone, L.E. (1995) Navel Orangeworm. *In*: Nechols, J.R., Andres, L.A., Beardsley, J.W., Goeden, R.D. & Jackson, C.G. (Eds.), *Biological Control in the western United States - accomplishments and benefits of Regional Research Project W-84, 1964-1989*. University of California, Division of Agriculture and Natural Resources Publication #3361, pp. 196–198.

Mercet, R.G. (1916) Calcididos de España. *Boletin de la Real Sociedad Española de Historia Natural*, 16, 112–117.

Mercet, R.G. (1917) Encirtinos de España. *Boletin de la Real Sociedad Española de Historia Natural*, 17, 538–544.

Mercet, R.G. (1921) *Fauna Ibérica. Himenópteros Fam. Encírtidos*. Museo Nacional de Ciencias Naturales, Madrid, 732 pp. http://dx.doi.org/10.5962/bhl.title.10362

Mercet, R.G. (1922) Calcidoideos nuevas de Francia. *Boletin de la Real Sociedad Española de Historia Natural*, 22, 396–402.

Mercet, R.G. (1923) Adiciones a la fauna española de Encírtidos (Hym. Chalc.) 2a nota. *Boletin de la Real Sociedad Español de Historia Natural*, 23, 49–56.

Mercet, R.G. (1925) El género *Aphycus* y sus afines. *Eos.Revista Española di Entomologia. Madrid,* 1, 7–31.

Meyerdirk, D.E. & Newell, I.M. (1979) Importation, colonization and establishment of natural enemies on the Comstock mealybug in California. *Journal of Economic Entomology*, 72, 70–73. http://dx.doi.org/10.1093/jee/72.1.70

Meyerdirk, D.E., Newell, I.M. & Warkentin, R.W. (1981) Biological control of Comstock mealybug (*Pseudococcus comstocki*). *Journal of Economic Entomology*, 74, 79–84. http://dx.doi.org/10.1093/jee/74.1.79

Michelbacher, A.E. & Hitchcock, S. (1957) Calico scale, *Lecanium cerasorum* Cockerell on walnuts. *The Pan-Pacific Entomologist*, 33, 15–18.

Millan de De Santis, E.M.D. & De Santis, L. (1960) Himenopteros parasitos de *Evetria buoliana* (Schiff.) en la Republica Argentina. *Revista de Investigaciones Agricolas, Buenos Aires*, 14, 25–29.

Miller, C.D.F. (1958) A new species of *Copidosoma* closely related to *C. nanellae* Silvestri (Hymenoptera: Encyrtidae). *The Pan-Pacific Entomologist*, 34, 57–61.

Miller, C.D.F. (1961) A new genus and species of chalcid (Hymenoptera: Encyrtidae). *The Canadian Entomologist*, 93, 494–496. http://dx.doi.org/10.4039/Ent93494-6

Miller, C.D.F. (1965) A Nearctic species of *Parablastothrix* Mercet (Hymenoptera: Encyrtidae). *The Canadian Entomologist*, 97, 750–753. http://dx.doi.org/10.4039/Ent97750-7

Miller, D.R. (1975) A revision of the genus *Heterococcus* Ferris with a diagnosis of *Brevennia* Goux (Homoptera: Coccoidea: Pseudococcidae). *United States Department of Agriculture Technical Bulletin*, 1497, 1–61.

Mitchell, R.G. (1962) Balsam woolly aphid predators native to Oregon and Washington. *Technical Bulletin, Oregon Agricultural Experiment Station*, 62, 1–63.

Motschulsky, V. de (1859) Insectes utiles et nuisibles. *Études Entomologiques*, 8, 169–174.

Moursi, A.A. (1948) Description of two new species of *Anagyrus*. *Bulletin Société Fouad Ier d'Entomologie*, 32, 1–7.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., de Fonseca, G.B.A. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature*, 403, 853–858. http://dx.doi.org/10.1038/35002501

Nees ab Esenbeck, C.G. (1834) *Hymenopterorum Ichneumonibus affinium Monographiae, genera Europaea et species illustrantes. Vol. 2.* J.G. Cottae, Stuttgart und Tübingen, 448 pp.

Neunenschwander, P., Hennessey, R.D. & Herren, H.R. (1987) Food web of insects associated with the cassava mealybug, *Phenacoccus manihoti* Matile-Ferrero (Hemiptera: Pseudococcidae), and its introduced parasitoid, *Epidinocarsis lopezi* (De Santis) (Hymenoptera: Encyrtidae), in Africa. *Bulletin of Entomological Research*, 77, 177–189. http://dx.doi.org/10.1017/S0007485300011664

Noyes, J.S. (1979) The West Indian species of Encyrtidae described by L.O. Howard, 1894 and 1897 (Hymenoptera, Chalcidoidea). *Systematic Entomology*, 4, 143–169. http://dx.doi.org/10.1111/j.1365-3113.1979.tb00630.x

Noyes, J.S. (1980) A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea). *Bulletin of the British Museum (Natural History)*, 41, 107–253.

Noyes, J.S. (1988a) *Copidosoma truncatellum* (Dalman) and *C. floridanum* (Ashmead) (Hymenoptera, Encyrtidae), two

frequently misidentified polyembryonic parasitoids of caterpillars (Lepidoptera). *Systematic Entomology*, 3, 197–204. http://dx.doi.org/10.1111/j.1365-3113.1988.tb00241.x
Noyes, J.S. (1988b) Encyrtidae (Insecta: Hymenoptera). *Fauna of New Zealand*, 13, 1–188.
Noyes, J.S. (1994) The reliability of published host-parasitoid records: a taxonomist's viewpoint. *Norwegian Journal of Agricultural Sciences*, 16, 59–69.
Noyes, J.S. (1996) Encyrtidae (Hymenoptera: Chalcidoidea) of Costa Rica: the genera and species associated with the jumping plant-lice (Homoptera: Psylloidea). *Bulletin of the Natural History Museum*, 65, 105–164.
Noyes, J.S. (2000) Encyrtidae of Costa Rica (Hymenoptera: Chalcidoidea), 1. *Memoirs of the American Entomological Institute*, 62, 1–355.
Noyes, J.S. (2001) Interactive catalogue of world Chalcidoidea, Taxapad CD. Vancouver, Canada.
Noyes, J.S. (2004) Encyrtidae of Costa Rica (Hymenoptera: Chalcidoidea), 2. *Memoirs of the American Entomological Institute*, 73, 1–459.
Noyes, J.S. 2010. Encyrtidae of Costa Rica (Hymenoptera: Chalcidoidea), 3. *Memoirs of the American Entomological Institute*, 84, 1–848.
Noyes, J.S. (2015) Universal Chalcidoidea Database. World Wide Web electronic publication. Available from http://www.nhm.ac.uk/chalcidoids (accessed 30 April 2015)
Noyes, J.S. & Hanson, P. (1996) Encyrtidae (Hymenoptera: Chalcidoidea) of Costa Rica: the genera and species associated with jumping plant-lice (Homoptera: Psylloidea). *Bulletin of the Natural History Museum*, Entomology Series, 65, 105–164.
Noyes, J.S. & Hayat, M. (1994) *Oriental mealybug parasitoids of the Anagyrini* (*Hymenoptera*: *Encyrtidae*). CAB International, Wallingford, Oxon, 554 pp.
Noyes, J.S. & Woolley, J.B. (1994) North American encyrtid fauna (Hymenoptera: Encyrtidae): taxonomic changes and new taxa. *Journal of Natural History*, 28, 1327–1401. http://dx.doi.org/10.1080/00222939400770681
Noyes, J.S., Woolley, J.B. & Zolnerowich, G. (1997) Encyrtidae. *In*: Gibson, G.A.P., Huber, J.T. & Woolley, J.B. (Eds.), *Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera)*. NRC Research Press, Ottawa, pp. 170–320.
Oatman, E.R. (1978) Gelechiidae. *In* Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review*. Agriculture Handbook 480. Agriculture Research Service, United States Department of Agriculture, Washington, pp. 185–190.
Onillon, J.C. (1988) Lutte biologique et intégrée dans les vergers de citrus en zone Méditerranéenne. *Entomophaga*, 33, 481–494. http://dx.doi.org/10.1007/BF02373184
Özdikmen, H. (2011) New names for some preoccupied specific epithets in Chalcoidea I: Families Agaonidae, Aphelinidae, Chalcididae, Encyrtidae, Eulophidae (Hymenoptera; Parasitica). *Munis Entomology & Zoology*, 6, 796–814.
Parker, H.L., Berry, P.A. & Silveira Guido, A. (1953) Host-parasite and parasite lists of insects reared in the South American Parasite Laboratory during the period 1940-46. *Revista de la Asociación (Federación) Rural del Uruguay (Ingenieros Agrónomos)*, 92, 1–101.
Peck, O. (1951) Superfamily Chalcidoidea. *In*: Muesebeck, C.F.W., Krombein, K.V. & Townes, H.K. (Eds.), *Hymenoptera of America north of Mexico – synoptic catalog*. United States Department of Agriculture, Agriculture Monograph 2, Washington, pp. 410–594.
Peck, O. (1963) A catalogue of the Nearctic Chalcidoidea (Insecta: Hymenoptera). *The Canadian Entomologist*, 30 (Supplement), 1–1092.
Perkins, R.C.L. (1906) Leaf-hoppers and their natural enemies (Pt. VIII. Encyrtidae, Eulophidae, Trichogrammatidae). *Bulletin of the Hawaiian Sugar Planters' Association Experiment Station*, Entomology Series, 1, 239–267.
Porter, C.E. (1920) Cambio de nombre genérico (*Brethesia* to *Brethesiella*). *Revista Chilena de Historia Natural*, 24, 16.
Prinsloo, G.L. & Annecke, D.P. (1978) On some new and described Encyrtidae (Hymenoptera: Chalcidoidea) from the Ethiopian region. *Journal of the Entomological Society of South Africa*, 41, 311–331.
Proctor, W.P. (1938) Biological survey of the Mount Desert Region. Part 6. *The insect fauna with references to methods of capture, food plants, the flora and other biological features*. Wistar Institute of Anatomy & Biology, Philadelphia, 496 pp.
Quaintance, A.L. (1915) The San Jose scale and its control. *United States Department of Agriculture, Farmers' Bulletin*, 650, 1–27.
Ratzeburg, J.T.C. (1844) *Die Ichneumonen der Forstinsekten in entomologischer und forstlicher Bezeihung*. Nicolai, Berlin, 224 pp.
Riek, E.F. (1962) The Australian species of *Psyllaephagus* (Hymenoptera: Encyrtidae), parasites of psyllids (Homoptera). *Australian Journal of Zoology*, 10, 684–757. http://dx.doi.org/10.1071/ZO9620684
Riley, C.V., Ashmead, W.H. & Howard, L.O. (1894) Report upon the parasitic Hymenoptera of the island of St. Vincent. *Journal of the Linnean Society of London*, Zoology, 25, 56–254. http://dx.doi.org/10.1111/j.1096-3642.1894.tb00982.x
Risbec, J. (1951) Les Chalcidoides de l'Afrique occidentale française. *Mémoires de l'Institute Français d'Afrique Noire, Ifan-Dakar*, 13, 7–409.

Roltsch, W.J., Meyerdick, D.E., Warkentin, R., Andress, E.R. & Carrera, K. (2006) Classical biological control of the pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green), in southern California. *Biological Control*, 37, 155–166. http://dx.doi.org/10.1016/j.biocontrol.2006.01.006

Rosen, D. (1969) A systematic study of the genus *Acerophagus* E. Smith with descriptions of new species (Hymenoptera: Encyrtidae). *Hilgardia*, 40, 41–72. http://dx.doi.org/10.3733/hilg.v40n02p041

Rosen, D. (1981) Some concluding remarks. *In*: Rosen, D. (Ed.), *The role of hyperparasitism in biological control: a symposium*. Division of Agricultural Sciences, University of California, Priced publication 4103, pp. 50–52.

Rosen, D. & DeBach, P. (1978) Diaspididae. *In*: Clausen, C.P. (Ed.), *Introduced parasites and predators of arthropod pests and weeds*: *a world review*. Agriculture Handbook 480. Agriculture Research Service, United States Department of Agriculture, Washington, pp. 78–128.

Rosen, D. & Kfir, R. (1980) Biological studies of *Microterys flavus* (Howard) (Hymenoptera: Encyrtidae), a primary parasite of soft scales. *Journal of the Entomological Society of South Africa*, 43, 223–228.

Rossi, P. (1790) *Fauna Etrusca, sistens Insecta quae in provinciis Florentina et Pisana praesertim collegit Petris Rossius*. *Vol. 2*. Typis Thomae Masi & Sociorum, Liburni, 348 pp.

Roth, L.M. & Willis, E.R. (1960) The biotic associations of cockroaches. *Smithsonian Miscellaneous Collections*, 141, 1–470.

Rugman-Jones, P.F., Forster, L.D., Guerrieri, E., Luck, R.F., Morse, J.G., Monti, M.m. & Stouthamer, R. (2011) Taxon-specific multiplex-PCR for quick, easy, and accurate identification of encyrtid and aphelinid parasitoid species attacking soft scale insects in California citrus groves. *BioControl*, 56, 265–275. http://dx.doi.org/10.1007/s10526-010-9328-4

Ruschka, F. (1923) Beiträge zur Kenntnis einiger Encyrtiden-gattungen (Hym., Chalc.). *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien*, 72, 1–13.

Salwasser, J. (2003) California: a definition of biodiversity. *In: Atlas of the Biodiversity of California*. The Resources Agency, California Department of Fish & Game, California, pp. 2–3.

Say, T. (1828) Descriptions of some new species of Hymenoptera of the United States. *Contributions of the Maclurian Lyceum to the Arts and Sciences, Philadelphia*, 1, 67–83.

Schellenberg, J.R. (1803) *Genres des mouches diptères (représentés en XLII planches projettées et dessinées)*. Orell, Fuesli & Co., Zurich, 95 pp. http://dx.doi.org/10.5962/bhl.title.48777

Schweizer, H., Morse, J.G., Luck, R.F. & Forster, L.D. (2002) Augmentative releases of a parasitoid (*Metaphycus* sp. nr. *flavus*) against citricola scale (*Coccus pseudomagnoliarum*) on oranges in the San Joaquin Valley of California. *Biological Control*, 24, 153–161. http://dx.doi.org/10.1016/S1049-9644(02)00017-8

Shaffee, S.A., Alam, S.M. & Agarwal, M.M. (1975) Taxonomic survey of encyrtid parasites (Hymenoptera: Encyrtidae) in India. *Aligarh Muslim University Publications (Zoological Series) in Indian Insect Types*, 10, 1–125.

Sharkov, A. (1996) A review of the species of the genus *Mucrencyrtus* Noyes (Hymenoptera: Encyrtidae). *Proceedings of the Entomological Society of Washington*, 98, 350–368.

Shutova, N.N. & Kukhtina, A.V. (1955) Parasites and predators of pests subject to quarantine regulations and several other pests of agricultural plants. *Entomologicheskoe Obozrenie*, 34, 210–217.

Silvestri, F. (1909) Contribuzioni alla conoscenza biologica delgi Immenotteri parassiti, II(1). *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura, Portici*, 3, 29–85.

Silvestri, F. (1915) Contributo all conoscenza degli insetti dell'olivo dell'Eritrea e dell'Africa meridionalei. *Bollettino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura, Portici*, 9, 240–334.

Simanton, F.L. (1916) The terrapin scale: an important insect enemy of peach orchards. *Bulletin of the United States Department of Agriculture*, 351, 1–96. http://dx.doi.org/10.5962/bhl.title.64473

Siscaro, G. (1992) *Avetianella longoi* sp. n. (Hymenoptera Encyrtidae) egg parasitoid of *Phoracantha semipunctata* F. (Coleoptera Cerambycidae). *Bollettino di Zoologia Agraria e Bachicoltura, Milano*, 24, 205–212.

Slater, A.J., Hurlbert, M.J. & Lewis, V.R. (1981) Biological control of brownbanded cockroach. *California Agriculture*, 34, 16–18.

Slosson, A.T. (1906) Additional list of insects taken in alpine region of Mt. Washington. *Entomological News*, 17, 323–326.

Smith, E.A. (1880) Biological and other notes on *Pseudococcus aceris*. *North American Entomologist*, 1, 73–87.

Smith, H.S. (1923) Biological control work. *California State Department of Agriculture Monthly Bulletin*, 12, 334–337.

Smith, H.S. & Compere, H. (1928) A preliminary report on the insect parasites of the black scale *Saissetia oleae* (Bernard).*University of California Publications in Entomology*, 4, 231–334.

Smith, H.S. & Flanders, S.E. (1949) Recent introductions of entomophagous insects into California *Journal of Economic Entomology*, 42, 995–996.

Stauffer, S. & Rose, M. (1997) Biological control of soft scale insects in interior plantscapes in the USA. *In*: Ben-Dov, Y. & Hodgson, C.J. (Eds.), *Soft scale insects – their biology, natural enemies and control [Vol. 7B*]. Elsevier, Amsterdam & New York, pp. 183–205. http://dx.doi.org/10.1016/S1572-4379(97)80083-8

Struble, G.R. & Bedard, W.D. (1958) Arthropod enemies of the lodgepole needle miner, *Recurvaria milleri* Busck. *The Pan-*

Pacific Entomologist, 34, 181–186.
Subba Rao, B.R. (1957) Some new species of Indian Hymenoptera. *Proceedings of the Indian Academy of Sciences (B)*, 46, 376–390.
Sugonjaev, Y.S. (1964) Palearctic species of the genus *Blastothrix* Mayr (Hymenoptera, Chalcidoidea) with remarks on their biology and economic importance. Part 1. *Entomologicheskoe Obozrenie*, 43, 368–390.
Sugonjaev, Y.S. (1983) A review of the genus *Blastothrix* Mayr (Hymenoptera, Encyrtidae) in North America. *Entomologicheskoe Obozrenie*, 62, 601–609.
Sugonjaev, Y.S. & Trjapitzin, V.A. (1988) The genus *Metablastothrix* (Hymenoptera, Chalcidoidea, Encyrtidae) and its distribution in North America and Eurasia. *Entomologicheskoe Obozrenie*, 67, 182–187.
Tachikawa, T. (1956) Description of a new species of the genus *Pseudhomalopoda* Girault from Japan, with a list of the known species and their hosts of the *Habrolepis*-like genera. *Insecta Matsumurana*, 20, 90–96.
Tachikawa, T. (1963) Revisional studies of the Encyrtidae of Japan (Hymenoptera: Chalcidoidea). *Memoirs of Ehime University*, 9, 1–264.
Tachikawa, T. (1968) A new name for *Metaphycus eriococci* Alam (Hymenoptera: Chalcidoidea-Encyrtidae). *Transactions of the Shikoku Entomological Society*, 9, 111.
Tachikawa, T. (1979) A revision of the genus *Pseudhomalopoda* Girault with the description of a new genus (Hymenoptera: Chalcidoidea-Encyrtidae). *Transactions of the Shikoku Entomological Society*, 14, 163–170.
Tachikawa, T., Paik, W.H. & Paik, J.C. (1981) A new species of the genus *Caenohomalopoda* Tachikawa (Hymenoptera: Encyrtidae) parasitic on *Odonaspis secreta* (Homoptera: Diaspididae) from Korea. *Transactions of the Shikoku Entomological Society*, 15, 183–186.
Tassan, R.L. & Hagen, K.S. (1995) Iceplant scales. *In*: Nechols, J.R., Andres, L.A., Beardsley, J.W., Goeden, R.D. & Jackson, C.G. (Eds.), *Biological Control in the western United States - accomplishments and benefits of Regional Research Project W-84, 1964-1989.* University of California, Division of Agriculture and Natural Resources Publication #3361, pp. 150–154.
Taylor, R.L. (1929) The biology of the white pine weevil, *Pissodes strobi* (Peck) and a study of its insect parasites, from an economic viewpoint. *Entomologica Americana*, New Series, 10, 1–83.
Thomson, C.G. (1876) *Skandinaviens Hymenoptera. Vol. 4.* Berling, Lund, 192 pp.
Timberlake, P.H. (1913) Preliminary report on the parasites of *Coccus hesperidum* in California. *Journal of Economic Entomology*, 6, 293–303.
http://dx.doi.org/10.1093/jee/6.3.294
Timberlake, P.H. (1916) Revision of the parasitic Hymenopterous insects of the genus *Aphycus* Mayr, with notice of some related genera. *Proceedings of the United States National Museum*, 50, 561–640.
http://dx.doi.org/10.5479/si.00963801.50-2136.561
Timberlake, P.H. (1918) New genera and species of Encyrtidae from California parasitic in mealybugs (Hymenoptera). *University of California Publications in Entomology*, 1, 347–367.
Timberlake, P.H. (1919a) Observations on the sources of Hawaiian Encyrtidae (Hymenoptera). *Proceedings of the Hawaiian Entomological Society*, 4, 183–196.
Timberlake, P.H. (1919b) Descriptions of new genera and species of Hawaiian Encyrtidae (Hymenoptera). *Proceedings of the Hawaiian Entomological Society*, 4, 197–231.
Timberlake, P.H. (1919c) Revision of the parasitic chalcidoid flies of the genera *Homalotylus* and *Isodromus* Howard, with descriptions of two closely related genera. *Proceedings of the United States National Museum*, 56, 133–194.
http://dx.doi.org/10.5479/si.00963801.56-2293.133
Timberlake, P.H. (1920) Descriptions of new genera and species of Hawaiian Encyrtidae II (Hymenoptera). *Proceedings of the Hawaiian Entomological Society*, 4, 409–437.
Timberlake, P.H. (1922) A revision of the chalcid-flies of the encyrtid genus *Chrysoplatycerus*. *Proceedings of the United States National Museum*, 61, 1–10.
http://dx.doi.org/10.5479/si.00963801.61-2423.1
Timberlake, P.H. (1924) The parasites of *Pseudococcus maritimus* (Ehrhorn) in California (Hymenoptera, Chalcidoidea). Part I. Taxonomic studies. *University of California Publications in Entomology*, 3, 223–251.
Timberlake, P.H. (1926) Miscellaneous new chalcid-flies of the hymenopterous family Encyrtidae. *Proceedings of the United States National Museum*, 69, 1–34.
http://dx.doi.org/10.5479/si.00963801.69-2629.1
Timberlake, P.H. (1929) Three new species of the hymenopterous family Encyrtidae from New South Wales. *University of California Publications in Entomology*, 5, 5–18.
Triapitsyn, S.V. (2008) A review of *Tachardiobius* (Hymenoptera: Encyrtidae), with description of a new species from California, USA, a parasitoid of *Tachardiella* spp. (Hemiptera: Kerriidae), *Zootaxa*, 1716, 44–52.
Triapitsyn, S.V., González, D., Vickerman, D.B., Noyes, J.S. & White, E.B. (2007) Morphological, biological, and molecular comparisons among the different geographical populations of *Anagyrus pseudococci* (Hymenoptera: Encyrtidae), parasitoid of *Planococcus* spp. (Hemiptera: Pseudococcidae), with notes on *Anagyrus dactylopii*. *Biological Control*, 41, 14–24.
http://dx.doi.org/10.1016/j.biocontrol.2006.12.013
Trjapitzin, V.A. (1957) Species of the genus *Encyrtus* Latr. (Hymenoptera, Encyrtidae) in the USSR. *Entomologicheskoe Obozrenie*, 36, 699–714.

Trjapitzin, V.A. (1963) Species of the genus *Oobius* gen. n. (Hymenoptera, Encyrtidae) in the USSR. *Acta Entomologica Musei Nationalis Pragae*, 35, 543–547.
Trjapitzin, V.A. (1971) A Nearctic representative of the genus *Avetianella* Trjapitzin, 1968 (Hymenoptera, Encyrtidae). *Entomologicheskoe Obozrenie*, 50, 890–892.
Trjapitzin, V.A. (1972) Encyrtidae (Hymenoptera) collected by Soviet-Mongolian zoological expeditions in 1967-1969 I. *Nasekomye Mongolii*, 1, 613–644.
Trjapitzin, V.A. (1977) New genera and species of parasitic Hymenoptera of the family Encyrtidae (Hymenoptera: Chalcidoidea). *Folia Entomologica Hungarica*, 30, 153–166.
Trjapitzin, V.A. (1989) *Parasitic Hymenoptera of the Fam. Encyrtidae of Palearctics*. Nauka, Leningrad, 488 pp.
Trjapitzin, V.A. (1997) A new species of the encyrtid genus *Anusioptera* Brues (Hymenoptera, Encyrtidae) from the USA and Mexico. *Entomologicheskoe Obozrenie*, 76, 666–670.
Trjapitzin, V.A. (2006) A review of the encyrtid genus *Echthroplexiella* Mercet, 1921 (Hymenoptera, Encyrtidae) of the world with description of a new species from Mexico. *Entomologicheskoe Obozrenie*, 85, 662–675.
http://dx.doi.org/10.1134/S0013873806070086
Trjapitzin, V.A. (2010) A review of the genus *Gahaniella* Timberlake, 1926 (Hymenoptera: Chalcidoidea: Encyrtidae) with description of a new species from Mexico. *Russian Entomological Journal*, 19, 245–248.
Trjapitzin, V.A. & Gordh, G. (1978a) A review of the Nearctic Encyrtidae (Hymenoptera, Chalcidoidea). Communication I. *Entomologicheskoe Obozrenie*, 57, 364–385.
Trjapitzin, V.A. & Gordh, G. (1978b) A review of the Nearctic Encyrtidae (Hymenoptera, Chalcidoidea). Communication II. *Entomologicheskoe Obozrenie*, 57, 636–652.
Trjapitzin, V.A., Myartseva, S.N. & Ruiz Cancino, E. (2001) Description of a new species of *Anagyrus* Howard, 1896 (Hymenoptera: Chalcidoidea: Encyrtidae) from Mexico and USA, with a review of economically important species. *Russian Entomological Journal*, 10, 411–415.
Trjapitzin, V.A., Myartseva, S.N., Ruiz Cancino, E. & Coronado-Blanco, J.M. (2008) Clave de géneros de Encyrtidae (Hymenoptera: Chalcidoidea) de México y un catálogo de las especies. *Serie Avispas parasíticas de plagas y otros insectos*. Universidad Autónoma de Tamaulipas, Cuidad Victoria, 265 pp.
Trjapitzin, V.A. & Ruiz Cancino, E. (1995) Annotated check-list of encyrtids (Hymenoptera: Chalcidoidea: Encyrtidae) of Mexico. *Folia Entomologica Mexicana*, 94, 7–32.
Trjapitzin, V.A. & Ruiz Cancino, E. (2009) Especies del Género *Anicetus* Howard (Hymenoptera: Encyrtidae) del nuevo mundo. *Acta Zoológica Mexicana*, New Series, 25, 249–268.
Trjapitzin, V.A. & Triapitsyn, S.V. (2006) A new species of *Brethesiella* (Hymenoptera: Encyrtidae) from California, USA, a parasitoid of *Steatococcus tabernicolus* (Hemiptera: Margarodidae). *Zootaxa*, 1167, 1–16.
Trjapitzin, V.A. & Triapitsyn, S.V. (2007) Key to world species of the genus *Ectroma* Westwood, 1833 (Hymenoptera: Encyrtidae), with redescription of *E. koponeni* Trjapitzin, 1989 from Madeira, Portugal. *Russian Entomological Journal*, 16, 237–239.
Trjapitzin, V.A. & Zuparko, R.L. (2005) A synopsis of the genus *Cheiloneurus* Westwood, 1833 (Hymenoptera: Chalcidoidea: Encyrtidae) of the New World. *Russian Entomological Journal*, 13, 257–266.
Unruh, T.R., Westigard, P.H. & Hagen, K.S. (1995) Pear Psylla. *In*: Nechols, J.R., Andres, L.A., Beardsley, J.W., Goeden, R.D. & Jackson, C.G. (Eds.), *Biological Control in the western United States - accomplishments and benefits of Regional Research Project W-84, 1964-1989.* University of California, Division of Agriculture and Natural Resources Publication #3361, pp. 95–100.
van den Bosch, R., Bartlett, B.R. & Flanders, S.E. (1955) A search for natural enemies of Lecaniine scale insects in northern Africa for introduction into California. *Journal of Economic Entomology*, 48, 53–55.
http://dx.doi.org/10.1093/jee/48.1.53
Viereck, H.L. (1916) Guide to the Insects of Connecticut. Part III. The Hymenoptera, or wasp-like insects of Connecticut. *State of Connecticut State Geological and Natural History Survey Bulletin*, 22, 1–824.
Viggiani, G. (1967) Ricerche sugli Hymenoptera Chalcidoidea. XIII. Sugli entomoparassiti della *Semidalis aleurodiformis* Steph. (Neur. Coniopterygidae), con descrizione di un nuovo genere di Encyrtidae (Prima nota). *Bollettino del Laboratoria di Entomologia Agraria 'Filippo Silvestri' di Portici,* 25, 163–175.
Vol, J.E. de & Goeden, R.D. (1973) Biology of *Chelinidea vittiger* with notes on its host-plant relationships and value on biological weed control. *Environmental Entomology*, 2, 231–240.
http://dx.doi.org/10.1093/ee/2.2.231
Walker, F. (1837) Monographia Chalciditum. *Entomological Magazine*, 4, 439–461.
Walker, F. (1838) Monographia Chalciditum. *Entomological Magazine*, 5, 418–431.
Walker, F. (1844) Descriptions of some British Chalcidites. *Annals and Magazine of Natural History*, 14, 181–185.
http://dx.doi.org/10.1080/037454809496377
Walker, F. (1846) Characters of undescribed Chalcites. *Annals and Magazine of Natural History*, 17, 177–185.
http://dx.doi.org/10.1080/037454809495585
Walker, F. (1847) Characters of undescribed Chalcites collected in North America by E. Doubleday, Esq., and now in the British Museum. *Annals and Magazine of Natural History*, 20, 19–29.
http://dx.doi.org/10.1080/037454809496006
Walker, F. (1872) Notice of species found in Madeira. *Notes on Chalcidiae*, 7, 106–129.

Walker, H.G. & Anderson, L.D. (1933) Report on the control of the harlequin bug, *Murgantia histrionica* Hahn, with notes on the severity of an outbreak of this insect in 1932. *Journal of Economic Entomology*, 26, 126–135. http://dx.doi.org/10.1093/jee/26.1.129
Weseloh, R.M. (1969) Biology of *Cheiloneurus noxius*, with emphasis on host relationships and oviposition behavior. *Annals of the Entomological Society of America*, 62, 299–305. http://dx.doi.org/10.1093/aesa/62.2.299
Westwood, J.O. (1832) Descriptions of several new British forms amongst the parasitic hymenopterous insects. *Philosophical Magazine*, 1, 127–129. http://dx.doi.org/10.1080/14786443208647849
Westwood, J.O. (1833) Descriptions of several new British forms amongst the parasitic hymenopterous insects. *Philosophical Magazine*, 3, 342–344. http://dx.doi.org/10.1080/14786443308648197
Westwood, J.O. (1837a) Description of a new genus of British parasitic hymenopterous insects. *Magazine of Natural History*, New Series, 1, 257–259.
Westwood, J.O. (1837b) Descriptions of some new British hymenopterous insects. *Philosophical Magazine*, 10, 440–442.
Wysoki, M., Swirski, E. & Izhar, Y. (1989) Biological control of avocado pests in Israel. *Protection Ecology*, 3, 25–28.
Zhang, Y. & Huang, D. (2004) *A review and an illustrated key to genera of Encyrtidae (Hymenoptera: Chalcidoidea) from China*. Science Press, Beijing, 166 pp.
Zolnerowich, G. & Zuparko, R.L. (2011) *Copidosoma howardi*, a new name for *Parapsilophrys gelechiae* Howard, 1898. *The Pan-Pacific Entomologist*, 86, 135–138.
Zuparko, R.L. (1995a) New host record for *Metanotalia maderensis* (Walker) (Hymenoptera: Encyrtidae). *The Pan-Pacific Entomologist*, 71, 245–246.
Zuparko, R.L. (1995b) Notes on *Parablastothrix nearctica* (Hymenoptera: Encyrtidae). *Proceedings of the Entomological Society of Washington*, 97, 884–886.
Zuparko, R.L. (2009) Lectotype designation for *Anagyrus smithi* Doutt. *The Pan-Pacific Entomologist*, 84, 244–245. http://dx.doi.org/10.3956/2008-02.1
Zuparko, R.L. & Dahlsten, D.L. (1995) Parasitoid complex of *Eucallipterus tiliae* (Homoptera: Drepanosiphidae) in northern California. *Environmental Entomology*, 24, 730–737. http://dx.doi.org/10.1093/ee/24.3.730
Zuparko, R.L. & Hamai, J. (1994) Depositions of parasitic Hymenoptera (Insecta) types from the University of California, Berkeley. *The Pan-Pacific Entomologist*, 70, 313–317.

APPENDIX I. Host-parasitoid index for encyrtid species known to be in California

Order BLATTODEA
Blattellidae
Supella longipalpa (Fabricius)
Comperia merceti
Supella supellectilium (Serville)
Comperia merceti

Order COLEOPTERA
Anobiidae
Vrilletta hubbardi Schwarz [nomen nudum]
Tineophoctonus hubbardi

Buprestidae
Buprestis aurulenta Linnaeus
Oobius buprestidis

Cerambycidae
Coptocercus aberrans (Newman)
Avetianella longoi
Epithora dorsalis (Macleay)
Avetianella longoi
Phoracantha semipunctata (Fabricius)
Avetianella longoi

Chrysomelidae
Bruchus brachialis Fahreus
Lamennaisia ambigua

Coccinellidae
Adalia bipunctata (Linnaeus)
Homalotylus terminalis
Anatis labiculata (Say)
Homalotylus terminalis
Cheilomenes sexmaculatus (Fabricius)
Homalotylus terminalis
Chilocorus similis (Rossi)
Homalotylus terminalis
Coccinella californica Mannerheim
Homalotylus terminalis
Coccinella novemnotata Herbst
Homalotylus terminalis
Coccinella quinquenotata Kirby
Homalotylus terminalis
Coccinella quinquepunctata Linnaeus
Homalotylus terminalis
Coccinella transversoguttata Falderman
Homalotylus terminalis
Coleomegilla innotata (Mulsant)
Homalotylus terminalis
Coleomegilla maculata (DeGeer)
Homalotylus terminalis
Coleomegilla sp.
Homalotylus terminalis
Cycloneda sanguinea (Linnaeus)
Homalotylus terminalis
Cycloneda sp.
Homalotylus terminalis
Disonycha sp.
Homalotylus terminalis
Hippodamia convergens Guerin-Meneville
Homalotylus terminalis
Hyperaspis pleuralis Casey
Cheiloneurus banksi (H) **NEW** (EMEC)
Homalotylus affinis
Hyperaspis undulata (Say)
Homalotylus hyperaspidis
Hyperaspis osculans LeConte
Homalotylus affinis
Hyperaspis bigeminata (Randall)
Homalotylus similis
Myzia pullata (Say)
Homalotylus terminalis
Psyllobora vigintimaculata (Say)
Homalotylus terminalis
Scymnus americanus Mulsant
Homalotylus similis
Scymnus cervicalis Mulsant
Homalotylus similis

Scymnus iowensis Casey
Homalotylus similis
Scymnus lacustris (LeConte)
Homalotylus similis
Scymnus sp.
Homalotylus terminalis

Lathridiidae
Melanophthalma sp.
Lamennaisia ambigua

Nitidulidae
Carpophilus hemipterus (Linnaeus)
Cerchysiella scutellata
Stelidota geminata (Say)
Cerchysiella scutellata

Orthoperidae
Undetermined genus
Lamennaisia ambigua **NEW** (UCDC)

Order DIPTERA
Cecidomyiidae
Mayetiola destructor (Say)
Cheiloneurus elegans (H)
Walshomyia cupressi Gagne
Pseudencyrtoides cupressi

Chamaemyiidae
Leucopis glyphinivora Tanasijtschuk
Agromyzaphagus detrimentosus
Leucopis ?*minor* Malloch
Agromyzaphagus detrimentosus
Leucopis obscura Haliday
Syrphophagus aphidivorus

Calliphoridae
Calliphora augur Fabricius
Tachinaephagus zealandicus
Calliphora quadrimaculata (Swederus)
Tachinaephagus zealandicus
Calliphora stygia (Fabricius)
Tachinaephagus zealandicus
Calliphora vicina Robineau-Desvoidy
Tachinaephagus zealandicus
Chrysomya chloropyga (Wiedemann)
Tachinaephagus zealandicus
Chrysomya megacephala (Fabricius)
Tachinaephagus zealandicus
Chrysomya rufifacies (Macquart)
Tachinaephagus zealandicus
Chrysomya varipes (Macquart)
Tachinaephagus zealandicus

Chrysomya sp.
Tachinaephagus zealandicus
Lucilia cuprina (Wiedemann)
Tachinaephagus zealandicus
Lucilia sp.
Tachinaephagus zealandicus
Phaenicia sericata (Meigen)
Tachinaephagus zealandicus
Protocalliphora sp.
Tachinaephagus zealandicus

Ceratopogonidae
Forcipomyia hirtula (Zetterstedt)
Forcipestricis gazeaui

Chloropidae
Liohippelates pusio (Loew)
Ooencyrtus submetallicus

Fanniidae
Fannia canicularis (Linnaeus)
Tachinaephagus zealandicus
Muscidae
Haematobia exigua Meijere
Tachinaephagus zealandicus
Musca domestica Linnaeus
Tachinaephagus zealandicus
Musca sorbens (Wiedemann)
Tachinaephagus zealandicus
Musca sp
Tachinaephagus zealandicus
Muscina stabulans (Fallen)
Tachinaephagus zealandicus
Muscina sp.
Tachinaephagus zealandicus

Sarcophagidae
Bercaea cruentata (Meigen)
Tachinaephagus zealandicus
Oxysarcodexia varia (Walker)
Tachinaephagus zealandicus
Sarcophaga aurifrons (Macquart)
Tachinaephagus zealandicus
Sarcophaga impatiens Walker
Tachinaephagus zealandicus
Sarcophaga sp.
Tachinaephagus zealandicus
Stomoxys calcitrans (Linnaeus)
Tachinaephagus zealandicus

Stratiomyiidae
Microchrysa sp.
Tachinaephagus zealandicus

Syrphidae
Epistrophe emarginata (Say)
Syrphophagus smithi
Eupeodes lapponicus (Zetterstedt)
Bothriothorax nigripes
Eupeodes nitens (Zetterstedt)
Bothriothorax californicus
Syrphophagus smithi
Eupeodes volucris Osten Sacken
Bothriothorax nigripes
Neocnemodon rita (Curran)
Syrphophagus smithi
Scaeva pyrastri (Linnaeus)
Bothriothorax californicus
Sphaerophoria javana Wiedemann
Syrphophagus aphidivorus
Syrphus opinator Osten Sacken
Bothriothorax californicus
Bothriothorax faridi
Syrphophagus smithi
Xanthogramma sp.
Syrphophagus smithi **NEW** (UCRC)
Undetermined
Cheiloneurus compressicornis (H)

Ulidiidae
Tritoxa flexa (Wiedemann)
Tachinaephagus zealandicus

Order HEMIPTERA
Aclerdidae
Aclerda subterranea Signoret
Cheiloneurus elegans (H)

Aphalaridae
Agonoscena pistaciae Burckhardt & Lauterer
Syrphophagus aphidivorus (H)
Neophyllura arbuti Schwarz
Ginsiana arbuticola
Cardiaspina fiscella Taylor
Psyllaephagus brachiatus

Aphididae
Acyrthosiphon gossypii Mordvilko
Syrphophagus aphidivorus (H)
Acyrthosiphon malvae (Mosley)
Syrphophagus aphidivorus (H)
Acyrthosiphon pisum (Harris)
Syrphophagus aphidivorus (H)
Aphis craccivora Koch
Syrphophagus aphidivorus (H)
Aphis cytisorum Hartig
Syrphophagus aphidivorus (H)

Aphis fabae Scopoli
Syrphophagus aphidivorus (H)
Aphis gossypii Glover
Syrphophagus aphidivorus (H)
Aphis medicaginis Koch
Syrphophagus aphidivorus (H)
Aphis pomi DeGeer
Syrphophagus aphidivorus (H)
Aulacorthum solani (Kaltenbach)
Syrphophagus aphidivorus (H)
*Brachycaudus persicae (*Passerini)
Syrphophagus aphidivorus (H)
Brevicoryne brassicae (Linnaeus)
Syrphophagus aphidivorus (H)
Cavariella aquatica (Gillette & Bragg)
Syrphophagus aphidivorus (H)
Diuraphis frequens (Walker)
Syrphophagus aphidivorus (H)
Diuraphis noxia (Kurdjumov)
Syrphophagus aphidivorus (H)
Eucallipterus tiliae (Linnaeus)
Syrphophagus aphidivorus (H)
Hysteroneura setariae (Thomas)
Syrphophagus aphidivorus (H)
Illinoia liriodendri (Monell)
Syrphophagus aphidivorus (H)
Myzocallis coryli (Goeze)
Syrphophagus aphidivorus (H)
Myzus cerasi (Fabricius)
Syrphophagus aphidivorus (H)
Myzus persicae (Sulzer)
Syrphophagus aphidivorus (H)
Nearctaphis bakeri (Cowen)
Syrphophagus aphidivorus (H)
*Periphyllus aceris (*Linnaeus)
Syrphophagus aphidivorus (H)
Pterochlorides persicae (Cholodkovsky)
Syrphophagus aphidivorus (H)
Rhopalosiphoninus solani (Thomas)
Syrphophagus aphidivorus (H)
Rhopalosiphum maidis (Fitch)
Syrphophagus aphidivorus (H)
Rhopalosiphum padi (Linnaeus)
Syrphophagus aphidivorus (H)
Sanbornia juniperi Pergande
Syrphophagus aphidivorus (H)
Schizaphis gramimum (Rondani)
Syrphophagus aphidivorus (H)
Sitobion avenae (Fabricius)
Syrphophagus aphidivorus (H)
Therioaphis trifolii (Monell)
Syrphophagus aphidivorus (H)
Toxoptera aurantii (Boyer de Fonscolombe)
Syrphophagus aphidivorus (H)

Uroleucon compositae (Theobald)
Syrphophagus aphidivorus (H)

Asterolecaniidae
Asterodiaspis mina (Russell)
Epitetracnemus intersectus
Asterodiaspis quercicola (Bouché)
Epitetracnemus intersectus
Asterodiaspis variolosa (Ratzeburg)
Zaomma lambinus (H)
Asterolecanium sp.
Epitetracnemus intersectus
Zaomma lambinus (H)
Russellaspis pustulans (Cockerell)
Coccidoctonus dubius (H)

Cicadellidae
Undetermined sp.
Cheiloneurus flaccus (H)

Coccidae
Alichtensia argentina (Leonardi)
Gahaniella californica (H?)
Ceronema koebeli Green
Metaphycus lichtensiae
Ceroplastes brevicauda Hall
Diversinervus elegans
Metaphycus stanleyi
Ceroplastes ceriferus (Fabricius)
Anicetus annulatus
Ceroplastes cirripediformis Comstock
Ammonoencyrtus cirripediformis (H)
Metaphycus eruptor
Microterys nietneri
Ceroplastes destructor Newstead
Metaphycus helvolus
Diversinervus elegans
Microterys nietneri
Ceroplastes floridensis Comstock
Diversinervus elegans
Metaphycus eruptor
Metaphycus lounsburyi
Metaphycus zebratus
Microterys nietneri
Ceroplastes helichrysi Hall
Metaphycus helvolus
Ceroplastes japonicus (Green)
Microterys nietneri
Ceroplastes madagascariensis (Targioni Tozzetti)
Encyrtus infelix
Ceroplastes rubens Maskell
Epitetracnemus intersectus
Microterys nietneri

Ceroplastes rusci (Linnaeus)
Diversinervus elegans
Ceroplastes sp.
Cheiloneurus inimicus (H)
Diversinervus elegans
Metaphycus alberti
Metaphycus eruptor
Metaphycus helvolus
Metaphycus stanleyi
Coccus africanus (Newstead)
Metaphycus helvolus **NEW** (UCRC)
Coccus alpinus De Lotto
Metaphycus stanleyi
Coccus capparidis (Green)
Metaphycus lounsburyi
Coccus celatus De Lotto
Metaphycus stanleyi
Coccus hesperidum Linnaeus
Ammonoencyrtus cirripediformis (H)
Anicetus annulatus
Cheiloneurus noxius (H)
Coccidoctonus dubius (H)
Diversinervus elegans
Encyrtus aurantii
Encyrtus infelix
Eusemion longipenne (H)
Gahaniella californica
Metaphycus alberti
Metaphycus angustifrons
Metaphycus anneckei
Metaphycus eriococci
Metaphycus helvolus
Metaphycus lounsburyi
Metaphycus luteolus
Metaphycus stanleyi
Microterys nietneri
Coccus pseudomagnoliarum (Kuwana)
Anicetus annulatus
Diversinervus elegans
Encyrtus aurantii
Metaphycus helvolus
Metaphycus lounsburyi
Metaphycus luteolus
Metaphycus stanleyi
Microterys nietneri
Coccus viridis (Green)
Anicetus annulatus
Coccidoctonus dubius (H)
Encyrtus aurantii
Metaphycus helvolus
Metaphycus stanleyi
Microterys nietneri
Prochiloneurus dactylopii (H)

Didesmococcus unifasciatus (Archangelskaya)
Microterys sylvius
Drepanococcus cajani (Maskell)
Metaphycus zebratus
Drepanococcus chiton (Green)
Diversinervus elegans
Eriopeltis festucae (Boyer de Fonscolombe)
Metaphycus zebratus
Eriopeltis lichtensteini Signoret
Metaphycus zebratus
Eucalymnatus tessellatus (Signoret)
Anicetus annulatus
Encyrtus aurantii
Metaphycus helvolus
Metaphycus stanleyi
Microterys nietneri
Eulecanium cerasorum (Cockerell)
Blastothrix americana
Blastothrix longipennis
Encyrtus fuscus
Eulecanium excrescens (Ferris)
Blastothrix americana **NEW** (EMEC)
Eulecanium ficiphilum Borchsenius
Microterys sylvius
Eulecanium franconicum Lindinger
Cheiloneurus elegans (H)
Eulecanium kunoense (Kuwana)
Ammonoencyrtus californicus **NEW** (EMEC)
Diversinervus elegans
Eulecanium nocivum Borchsenius
Microterys sylvius
Eulecanium perinflatum (Cockerell)
Gahaniella californica
Eulecanium pubescens (Ehrhorn)
Blastothrix hedqvisti
Metaphycus lecanii
Eulecanium sericeum (Lindinger)
Microterys sylvius
Eulecanium tiliae (Linnaeus)
Encyrtus aurantii
Encyrtus fuscus
Metablastothrix claripennis
Microterys sylvius
Eulecanium sp.
Anicetus annulatus
Blastothrix americana
Blastothrix hedqvisti
Encyrtus aurantii
Encyrtus fuscus
Eusemion longipenne (H)
Metaphycus californicus
Metaphycus fuscipennis
Microterys nietneri
Microterys sylvius

Gascardia sp.
Diversinervus elegans
Microterys nietneri
Inglisia sp.
Diversinervus elegans
Lecanopsis formicarum Newstead
Metaphycus zebratus
Lichtensia chilianthi (Brain)
Metaphycus stanleyi
Lichtensia viburni (Signoret)
Metaphycus lounsburyi
Luzulaspis luzulae (Dufour)
Metaphycus zebratus
Maacoccus piperis (Green)
Microterys nietneri
Marsipococcus proteae (Brain)
Diversinervus elegans
Metaphycus helvolus
Mesolecanium nigrofasciatum (Pergande)
Encyrtus fuscus
Metaphycus californicus
Zaomma lambinus (H)
Milviscutulus mangiferae (Green)
Microterys nietneri
Nemolecanium graniforme (Wunn)
Aphycoides clavellatus
Parasaissetia litorea De Lotto
Metaphycus helvolus
Parasaissetia nigra (Nietner)
Coccidoctonus dubius (H)
Diversinervus elegans
Encyrtus aurantii
Encyrtus infelix
Metaphycus anneckei **NEW** (UCRC)
Metaphycus helvolus
Metaphycus stanleyi
Microterys nietneri
Parasaissetia sp.
Metaphycus helvolus
Metaphycus stanleyi
Parthenolecanium cerasifex (Fitch)
Encyrtus fuscus
Microterys nietneri
Parthenolecanium corni (Bouché)
Ammonoencyrtus californicus **NEW** (UCRC)
Blastothrix sp. nr. *britannica*
Blastothrix hedqvisti
Blastothrix longipennis
Diversinervus elegans
Encyrtus aurantii
Encyrtus fuscus
Gahaniella californica (H?)
Metablastothrix claripennis
Metaphycus californicus

Metaphycus helvolus
Metaphycus lounsburyi
Metaphycus luteolus
Metaphycus lecanii
Metaphycus zebratus
Microterys nietneri
Microterys sylvius
Parthenolecanium fletcheri (Cockerell)
Blastothrix hedqvisti
Blastothrix longipennis
Encyrtus aurantii
Metablastothrix claripennis
Microterys nietneri
Parthenolecanium persicae (Fabricius)
Encyrtus fuscus
Metaphycus alberti
Metaphycus helvolus
Metaphycus trimblei
Metaphycus zebratus
Microterys nietneri
Microterys sylvius
Parthenolecanium pomeranicum (Kawecki)
Blastothrix longipennis
Metaphycus zebratus
Parthenolecanium pruinosum (Coquillett)
Blastothrix hedqvisti
Blastothrix longipennis
Encyrtus fuscus
Metaphycus californicus
Parthenolecanium quercifex (Fitch,)
Ammonoencyrtus californicus **NEW** (UCRC)
Blastothrix hedqvisti
Blastothrix longipennis
Encyrtus fuscus
Metablastothrix claripennis
Metaphycus lecanii
Parthenolecanium quercitronis (Fitch)
Metaphycus flammeus
Parthenolecanium rufulum (Cockerell)
Blastothrix longipennis
Epitetracnemus intersectus
Metaphycus zebratus
Microterys sylvius
Phyllostroma myrtilli (Kaltenbach)
Zaomma lambinus (H)
Physokermes fasicatus Borchsenius
Aphycoides clavellatus
Physokermes hemicryphus (Dalman)
Aphycoides clavellatus
Physokermes insignicola (Craw)
Cheiloneurus inimicus (H)
Metaphycus lecanii
Metaphycus physokermis
Microterys mazzinini

Microterys physokermis
Physokermes jezoensis Siraiwa
Aphycoides clavellatus
Microterys sylvius
Physokermes piceae (Schrank)
Aphycoides clavellatus
Cheiloneurus elegans (H)
Physokermes sugonjaevi Danzig
Aphycoides clavellatus
Protopulvinaria pyriformis (Cockerell)
Encyrtus infelix
Metaphycus helvolus
Metaphycus stanleyi
Microterys nietneri
Pulvinaria aethiopica
Metaphycus helvolus
Pulvinaria aurantii Cockerell
Anicetus annulatus
Pulvinaria bigeloviae Cockerell
Metaphycus coquilletti
Pulvinaria delottoi Gill
Encyrtus saliens
Metaphycus funicularis
Metaphycus stramineus
Pulvinaria floccifera (Westwood)
Diversinervus elegans
Encyrtus aurantii
Pulvinaria kuwacola Kuwana
Anicetus annulatus
Pulvinaria mammeae Maskell
Microterys nietneri
Pulvinaria peregrina (Borchsenius)
Microterys nietneri
Pulvinaria polygonata Cockerell
Anicetus annulatus
Pulvinaria psidii Maskell
Anicetus annulatus
Diversinervus elegans
Encyrtus aurantii
Metaphycus angustifrons
Metaphycus helvolus
Metaphycus luteolus
Metaphycus stanleyi
Microterys nietneri
Pulvinaria urbicola Cockerell
Diversinervus elegans
Encyrtus infelix
Metaphycus helvolus
Pulvinaria vitis (Linnaeus)
Cheiloneurus elegans (H)
Encyrtus fuscus
Metaphycus zebratus
Microterys nietneri

Pulvinaria sp.
Encyrtus aurantii
Microterys nietneri
Pulvinariella mesembryanthemi (Vallot)
Ammonoencyrtus californicus **NEW** (UCRC)
Encyrtus saliens
Metaphycus funicularis
Metaphycus helvolus
Metaphycus luteolus
Metaphycus stanleyi
Metaphycus stramineus
Microterys nietneri
Pulvinariella sp.
Encyrtus saliens
Metaphycus funicularis
Pulvinarisca jacksoni (Newstead)
Metaphycus stanleyi **NEW** (UCRC)
Rhizopulvinaria nevesi (Gómez-Menor Ortega)
Adelencyrtus aulacaspidis
Rhodococcus perornatus (Cockerell & Parrott)
Metaphycus zebratus
Microterys sylvius
Rhodococcus spiraeae Borchsenius
Microterys sylvius
Rhodococcus turanicus (Archangelskaya)
Microterys sylvius
Saissetia coffeae (Walker)
Anicetus annulatus
Cheiloneurus noxius (H)
Coccidoctonus dubius (H)
Diversinervus elegans
Encyrtus aurantii
Encyrtus fuscus
Encyrtus infelix
Eusemion longipenne (H) **NEW** (UCRC)
Gahaniella californica (H?)
Metaphycus helvolus
Metaphycus lounsburyi
Metaphycus luteolus
Metaphycus stanleyi
Microterys nietneri
Saissetia miranda (Cockerell & Parrott)
Metaphycus anneckei
Microterys nietneri
Saissetia nigrella King
Metaphycus helvolus
Metaphycus stanleyi
Saissetia oleae (Olivier)
Ammonoencyrtus cirripediformis (H)
Anicetus annulatus
Cheiloneurus inimicus (H)
Cheiloneurus lineascapus (H)
Cheiloneurus noxius (H)
Coccidoctonus dubius (H)

Diversinervus elegans
Encyrtus aurantii
Encyrtus infelix
Metaphycus angustifrons
Metaphycus anneckei
Metaphycus hageni
Metaphycus helvolus
Metaphycus inviscus
Metaphycus lounsburyi
Metaphycus luteolus
Metaphycus stanleyi
Metaphycus zebratus
Microterys nietneri
Saissetia persimilis (Newstead)
Diversinervus elegans
Saissetia privigna De Lotto
Encyrtus aurantii
Saissetia somereni (Newstead)
Metaphycus helvolus
Metaphycus stanleyi
Saissetia sp.
Diversinervus elegans
Metaphycus helvolus
Metaphycus inviscus
Metaphycus stanleyi
Microterys nietneri
Sphaerolecanium prunastri (Boyer de Fonscolombe)
Encyrtus aurantii
Epitetracnemus intersectus
Microterys sylvius
Stotzia maxima Borchsenius
Microterys sylvius
Waxiella mimosae (Signoret)
Metaphycus anneckei

Coreidae
Anasa scorbutica (Fabricius)
Ooencyrtus submetallicus
Anasa tristis (De Geer)
Ooencyrtus californicus
Anoplocnemis curvipes (Fabricius)
Ooencyrtus kuvanae
Clavigralla tomentosicollis Stål
Ooencyrtus kuvanae
Leptoglossus gonagra (Fabricius)
Ooencyrtus submetallicus

Dactylopiidae
Dactylopius confusus (Cockerell)
Formicencyrtus thoreauini

Delphacidae
Tarophagus proserpina (Kirkaldy)
Cheiloneurus flaccus (H)

Diaspididae

Acutaspis paulista (Hempel)
- *Zaomma lambinus* (H)

Aonidiella aurantii (Maskell)
- *Aphycus immaculatus*
- *Comperiella bifasciata*
- *Habrolepis rouxi*

Aonidiella citrina (Coquillett)
- *Comperiella bifasciata*
- *Habrolepis rouxi*

Aonidiella eremocitri McKenzie
- *Comperiella bifasciata*

Aonidiella inornata McKenzie
- *Comperiella bifasciata*

Aonidiella orientalis (Newstead)
- *Comperiella bifasciata*
- *Habrolepis rouxi*

Aonidiella taxus (Leonardi)
- *Comperiella bifasciata*

Aonidiella sp.
- *Habrolepis rouxi*

Aspidiotus cryptomeriae Kuwana
- *Comperiella bifasciata*

Aspidiotus destructor Signoret
- *Comperiella bifasciata*
- *Zaomma lambinus* (H)

Aspidiotus nerii Bouché
- *Comperiella bifasciata*
- *Habrolepis rouxi*
- *Zaomma lambinus* (H)

Aspidiotus sp.
- *Habrolepis rouxi*

Aulacaspis difficilis (Cockerell)
- *Adelencyrtus aulacaspidis*
- *Zaomma lambinus* (H)

Aulacaspis rosae (Bouché)
- *Adelencyrtus aulacaspidis*
- *Arrenophagus chionaspidis*
- *Zaomma lambinus* (H)

Aulacaspis tegalensis (Zehntner)
- *Arrenophagus chionaspidis*

Chionaspis alnus Kuwana
- *Zaomma lambinus* (H)

Chionaspis ortholabis Comstock
- *Plagiomerus diaspidis* **NEW** (EMEC)

Chionaspis ramakrishnai Rao
- *Arrenophagus chionaspidis*

Chionaspis salicis (Linnaeus)
- *Adelencyrtus aulacaspidis*
- *Arrenophagus chionaspidis*
- *Zaomma lambinus* (H)

Chrysomphalus aonidum (Linnaeus)
- *Comperiella bifasciata*
- *Habrolepis rouxi*

Zaomma lambinus (H)
Chrysomphalus bifasciculatus Ferris
Comperiella bifasciata
Chrysomphalus dictyospermi (Morgan)
Arrenophagus chionaspidis
Comperiella bifasciata
Chrysomphalus sp.
Comperiella bifasciata
Habrolepis rouxi
Zaomma lambinus (H)
Clavaspis sp.
Plagiomerus diaspidis
Contigaspis sp.
Arrenophagus chionaspidis
Diaspidiotus bavaricus (Lindinger)
Epitetracnemus intersectus
Diaspidiotus forbesi (Johnson,)
Arrenophagus chionaspidis
Diaspidiotus gigas (Thiem & Gerneck)
Comperiella bifasciata
Epitetracnemus intersectus
Diaspidiotus juglansregiae (Comstock)
Coccidencyrtus ensifer
Coccidencyrtus infuscatus
Zaomma lambinus (H)
Diaspidiotus macroporanus (Takagi)
Adelencyrtus aulacaspidis
Epitetracnemus intersectus
Diaspidiotus marani (Zahradnik)
Zaomma lambinus (H)
Diaspidiotus ostreaeformis (Curtis)
Epitetracnemus intersectus
Zaomma lambinus (H)
Diaspidiotus perniciosus (Comstock)
Arrenophagus chionaspidis
Coccidencyrtus ensifer
Comperiella bifasciata
Epitetracnemus intersectus
Zaomma lambinus (H)
Diaspidiotus prunorum (Laing)
Epitetracnemus intersectus
Zaomma lambinus (H)
Diaspidiotus pyri (Lichtenstein)
Epitetracnemus intersectus
Zaomma lambinus (H)
Diaspidiotus zonatus (Frauenfeld)
Zaomma lambinus (H)
Diaspis boisduvalii Signoret
Arrenophagus chionaspidis
Coccidencyrtus ochraceipes
Encyrtus aurantii
Diaspis bromeliae (Kerner)
Coccidencyrtus ochraceipes

Diaspis echinocacti (Bouché)
Comperiella bifasciata
Plagiomerus diaspidis
Diaspis sp.
Arrenophagus chionaspidis
Coccidencyrtus ochraceipes
Duplachionaspis sansevieriae Williams
Adelencyrtus odonaspidis
Dynaspidiotus abietis (Schrank)
Comperiella bifasciata
Zaomma lambinus (H)
Dynaspidiotus britannicus (Newstead)
Arrenophagus chionaspidis
Dynaspidiotus tsugae (Marlatt)
Arrenophagus chionaspidis
Fiorinia externa Ferris
Arrenophagus chionaspidis
Fiorinia saprosmae Green
Arrenophagus chionaspidis
Froggattiella penicillata (Green)
Caenohomalopoda shikokuensis
Furchadaspis zamiae (Morgan)
Arrenophagus chionaspidis
Neococcidencyrtus poutiersi
Hemiberlesia lataniae (Signoret)
Plagiomerus diaspidis
Hemiberlesia rapax (Comstock)
Comperiella bifasciata
Habrolepis rouxi
Lepidosaphes conchiformis (Gmelin)
Zaomma lambinus (H)
Lepidosaphes cupressi Borchsenius
Adelencyrtus aulacaspidis
Lepidosaphes japonica (Kuwana)
Arrenophagus chionaspidis
Lepidosaphes malicola Borchsenius
Zaomma lambinus (H)
Lepidosaphes tubulorum Ferris
Epitetracnemus intersectus
Zaomma lambinus (H)
Lepidosaphes ulmi (Linnaeus)
Epitetracnemus intersectus
Zaomma lambinus (H)
Lepidosaphes sp.
Plagiomerus diaspidis **NEW** (UCRC)
Lopholeucaspis japonica (Cockerell)
Arrenophagus chionaspidis
Morganella longispina (Morgan)
Comperiella bifasciata
Odonaspis ruthae Kotinsky
Adelencyrtus odonaspidis
Odonaspis saccharicaulis (Zehntner)
Adelencyrtus odonaspidis

Odonaspis sp.
Adelencyrtus odonaspidis
Parlatoria oleae (Colvée)
Habrolepis rouxi
Parlatoria pergandii Comstock
Metaphycus helvolus **NEW** (UCRC)
Parlatoria ziziphi (Lucas)
Arrenophagus chionaspidis
Pinnaspis aspidistrae (Signoret)
Arrhenophagus chionaspidis
Pinnaspis dysoxyli (Maskell)
Arrenophagus chionaspidis
Pinnaspis strachani (Cooley)
Arrenophagus chionaspidis
Pseudaulacaspis cockerelli (Cooley)
Arrenophagus chionaspidis
Pseudaonidia duplex (Cockerell)
Epitetracnemus intersectus
Pseudaonidia paeoniae (Cockerell)
Epitetracnemus intersectus
Pseudaulacaspis pentagona (Targioni Tozzetti)
Adelencyrtus aulacaspidis
Arrenophagus chionaspidis
Comperiella bifasciata
Epitetracnemus intersectus
Zaomma lambinus (H)
Rhizaspidiotus dearnessi (Cockerell)
Ceraptroceroideus cinctipes
Selenaspidus articulatus (Morgan)
Habrolepis rouxi
Unaspis citri (Comstock)
Arrenophagus chionaspidis
Unknown, AKA "*Aspidiotus corticalis*" Riley, MSS
Coccidencyrtus ensifer

Eriococcidae
Eriococcus adenostomae Ehrhorn
Metaphycus clauseni
Eriococcus buxi (Boyer de Fonscolombe)
Encyrtus aurantii
Eriococcus coccineus Cockerell
Metaphycus clauseni **NEW** (UCRC)
Eriococcus palustris Dodds
Metaphycus clauseni
Eriococcus quercus (Comstock)
Metaphycus eriococci
Eriococcus spurius (Modeer)
Blastothrix longipennis
Microterys sp.
Trichomasthus coeruleus
Zaomma lambinus (H)
Eriococcus tinsleyi Cockerell
Metaphycus howardi

Eriococcus sp.
Cheiloneurus banksi (H)
Metaphycus argyrocomus
Metaphycus clauseni
Metaphycus fumipennis
Metaphycus howardi

Kermesidae
Allokermes essigi (King)
Metaphycus kermicola
Allokermes galliformis (Riley)
Metaphycus kermicola
Kermes cockerelli Ehrhorn
Microterys yolandae
Oesol anubis
Psilophryoidea comesor
Kermes nigropunctatus Ehrhorn & Cockerell
Cheiloneurus lineascapus (H)
Kermes sp.
Cheiloneurus elegans (H)
Nanokermes pubescens (Bogue)
Blastothrix longipennis

Kerriidae
Tachardiella larreae (Comstock)
Tachardiobius nigricans

Lecanodiaspididae
Lecanodiaspis rufescens (Cockerell)
Cheiloneurus inimicus (H) **NEW** (UCRC)

Margarodidae
Steatococcus tabernicolus Ferris
Brethesiella mojave
Xylococculus macrocarpae (Coleman)
Deilio xylococculi

Pentatomidae
Dichelops furcatus (Fabricius)
Ooencyrtus submetallicus
Edessa meditabunda (Fabricius)
Ooencyrtus submetallicus
Edessa sp.
Ooencyrtus submetallicus
Euschistus heros (Fabricius)
Ooencyrtus submetallicus
Mormidea angustata Stål
Ooencyrtus submetallicus
Nezara viridula (Linnaeus)
Ooencyrtus submetallicus
Oebalus ypsilongriseus (DeGeer)
Ooencyrtus submetallicus
Piezodorus guildinii (Westwood)
Ooencyrtus submetallicus

Pseudococcidae

Amonostherium lichtensioides (Cockerell)
- *Anagyrus yuccae* **NEW** (UCRC)
- *Cheiloneurus inimicus* (H) **NEW** (UCRC)
- *Formicencyrtus neomexicanus*
- *Metaphycus clauseni*
- *Pseudleptomastix squammulata*

Anisococcus adenostomae (Ferris)
- *Chrysoplatycerus ferrisi*

Anisococcus crawii (Coquillett)
- *Acerophagus fasciipennis*
- *Anagyrus yuccae*
- *Zarhopalus corvinus* **NEW** (UCRC)
- *Zarhopalus sheldoni* **NEW** (UCRC)

Antonina graminis (Maskell)
- *Cheiloneurus banksi (H)*
- *Neodusmetia sangwani*

Antonina purpurea Signoret
- *Metanotalia madeirensis*

Brevennia pulveraria (Newstead)
- *Ericydnus sipylus*

Coccura suwakoensis (Kuwana & Toyoda)
- *Acerophagus malinus*

Delottococcus quaesitus (Brain)
- *Leptomastix dactylopii*

Delottococcus proteae (Hall)
- *Leptomastix dactylopii*

Dysmicoccus brevipes (Cockerell)
- *Acerophagus angelicus*
- *Chrysoplatycerus splendens*
- *Leptomastidea abnormis*
- *Leptomastix dactylopii*

Dysmicoccus ryani (Coquillet)
- *Acerophagus angelicus*
- *Acerophagus antennalis*
- *Acerophagus fasciipennis* **NEW** (UCRC)
- *Acerophagus notativentris*
- *Chrysoplatycerus splendens*
- *Cirrhencyrtus ehrhorni*
- *Gyranusoidea claripennis*
- *Leptomastidea abnormis*
- *Leptomastix dactylopii* **NEW** (UCRC)

Dysmicoccus timberlakei (Cockerell)
- *Cheiloneurus banksi* **NEW** (EMEC)
- *Rhopus* sp. **NEW** (EMEC)
- *Stemmatosteres apterus*

Eurycoccus blancharidii (King & Cockerell)
- *Acerophagus notativentris*

Ferrisia virgata (Cockerell)
- *Acerophagus angelicus*
- *Acerophagus notativentris*
- *Acerophagus pallidus*
- *Acerophagus texanus*
- *Aenasius flandersi*

Anagyrus californicus ***NEW*** *(UCRC)*
Chrysoplatycerus splendens
Coccidoxenoides perminutus
Holcencyrtus myrmicoides
Leptomastidea abnormis
Leptomastix dactylopii
Prochiloneurus dactylopii (H)
Tetracnemoidea peregrina
Zarhopalus sheldoni **NEW** (CSCA)
Formicococcus njalensis (Laing)
Acerophagus angelicus
Acerophagus notativentris
Acerophagus pallidus
Holcencyrtus myrmicoides
Leptomastidea abnormis
Leptomastix dactylopii
Heliococcus atriplicis McKenzie
Aenasius sp. nr. *phenacocci* **NEW** (UCRC)
Maconellicoccus hirsutus (Green)
Anagyrus kamali
Gyranusoidea indica
Nipaecoccus viridis (Newstead)
Anagyrus kamali
Gyranusoidea indica
Leptomastix dactylopii
Nipaecoccus sp.
Gyranusoidea indica
Oracella acuta (Lobdell)
Acerophagus coccois
Phenacoccus acericola King
Acerophagus coccois
Phenacoccus aceris (Signoret)
Acerophagus coccois
Phenacoccus colemani Ehrhorn
Acerophagus angelicus **NEW** (UCRC)
Phenacoccus gossypii Townsend & Cockerell
Acerophagus angelicus
Acerophagus coccois
Acerophagus pallidus
Aenasius flandersi
Anagyrus californicus ***NEW*** *(UCRC)*
Chrysoplatycerus ferrisi
Dicarnosis ripariensis
Ericydnus lamasi
Leptomastidea abnormis
Leptomastix dactylopii
Phenacoccus hargreavesi (Laing)
Leptomastix dactylopii
Phenacoccus herreni Cox & Williams
Acerophagus coccois
Aenasius flandersi
Phenacoccus hordei (Lindeman)
Cheiloneurus elegans (H)

Phenacoccus maderiensis Green
Acerophagus coccois
Aenasius flandersi
Acerophagus pallidus
Holcencyrtus myrmicoides
Leptomastix dactylopii
Metanotalia madeirensis
?*Phenacoccus maderiensis* Green
Acerophagus angelicus
Coccidoxenoides perminutus
Phenacoccus manihoti Matile-Ferrero
Acerophagus coccois
Prochiloneurus dactylopii (H)
Phenacoccus pergandei Cockerell
Acerophagus angelicus **NEW** (UCRC)
Phenacoccus saccharifolii (Green)
Leptomastix dactylopii
Phenacoccus solani Ferris
*Acerophagus angelicus **NEW** (UCRC)*
Acerophagus pallidus
Aenasius phenacocci
Anagyrus californicus
Ectromatopsis americana
Leptomastix dactylopii
Metaphycus fumipennis
Phenacoccus solenopsis Tinsley
Aenasius arizonensis
Aenasius phenacocci
Prochiloneurus dactylopii (H)
Phenacoccus sp.
Aenasius paulistus
Anagyrus californicus
Blepyrus tenuiscapus
Cheiloneurus banksi (H) **NEW** (UCRC)
Ericydnus lamasi
Leptomastidea abnormis
Stemmatosteres apterus
Zarhopalus sheldoni
Planococcus aemulor De Lotto
Leptomastix dactylopii
Planococcus citri (Risso)
Acerophagus angelicus
Chrysoplatycerus splendens
Coccidoxenoides perminutus
Encyrtus aurantii
Ericydnus lamasi
Holcencyrtus myrmicoides
Leptomastidea abnormis
Leptomastix dactylopii
Prochiloneurus dactylopii (H)
Planococcus ficus (Signoret)
Chrysoplatycerus splendens
Leptomastidea abnormis
Leptomastix dactylopii

Planococcus kenyae (Le Pelley)
Coccidoxenoides perminutus
Leptomastidea abnormis
Leptomastix dactylopii
Planococcus kraunhiae (Kuwana)
Leptomastidea abnormis
Leptomastix dactylopii
Planococcus lilacinus (Cockerell)
Leptomastix dactylopii
Planococcus minor (Maskell)
Leptomastix dactylopii
Planococcus vovae (Nasonov)
Coccidoxenoides perminutus
Leptomastidea abnormis
Leptomastix dactylopii
Planococcus sp. nr. *ficus*
Coccidoxenoides perminutus
Leptomastidea abnormis
Planococcus sp.
Leptomastix dactylopii
Pseudococcus antricolens Ferris
Gyranusoidea advena
Pseudococcus calceolariae (Maskell)
Acerophagus angelicus
Aenasius paulistus
Chrysoplatycerus splendens
Leptomastidea abnormis
Leptomastix dactylopii
Tetracnemoidea brevicornis
Tetracnemoidea peregrina
Tetracnemoidea sydneyensis
Pseudococcus comstocki (Kuwana)
Acerophagus abstrusus
Acerophagus coccois ***NEW*** *(UCRC)*
Acerophagus malinus
Acerophagus notativentris
Chrysoplatycerus splendens
Leptomastidea abnormis
Leptomastix dactylopii
Prochiloneurus dactylopii (H)
Prochiloneurus modestus (H) ***NEW*** *(UCRC)*
Zarhopalus corvinus
Zarhopalus sheldoni
Pseudococcus concavocerarii James
Leptomastix dactylopii
Pseudococcus cryptus Hempel
Coccidoxenoides perminutus **NEW** (UCRC)
Leptomastidea abnormis
Pseudococcus longispinus (Targioni Tozzetti)
Acerophagus angelicus
Acerophagus malinus **NEW** (UCRC)
Aenasius paulistus
Chrysoplatycerus splendens
Coccidoxenoides perminutus

Encyrtus aurantii
Gyranusoidea advena
Holcencyrtus myrmicoides
Leptomastidea abnormis
Leptomastix dactylopii
Tetracnemoidea brevicornis
Tetracnemoidea peregrina
Tetracnemoidea sydneyensis
Zarhopalus sheldoni
Pseudococcus maritimus (Ehrhorn)
Acerophagus angelicus
Acerophagus maculipennis
Acerophagus notativentris
Acerophagus pallidus
Aenasius paulistus
Anagyrus clauseni
Anagyrus yuccae
Chrysoplatycerus splendens
Coccidoxenoides perminutus
Ericydnus lamasi
Leptomastidea abnormis
Leptomastix dactylopii
Pseudleptomastix squammulata
Tetracnemoidea brevicornis
Tetracnemoidea peregrina
Zarhopalus corvinus
Zarhopalus sheldoni
Pseudococcus neomaritimus Beardsley
Ericydnus lamasi
Pseudococcus occiduus De Lotto
Leptomastix dactylopii
Pseudococcus pipturicolus Beardsley
Gyranusoidea advena
Pseudococcus sociabilis Hambleton
Aenasius paulistus
Pseudococcus viburni (Signoret)
Acerophagus flavidulus
Acerophagus maculipennis
Acerophagus notativentris
Chrysoplatycerus splendens
Leptomastidea abnormis
Leptomastix dactylopii
Tetracnemoidea brevicornis
Tetracnemoidea peregrina
Zarhopalus sheldoni **NEW** (UCRC)
Pseudococcus sp.
Acerophagus abstrusus
Acerophagus angelicus
Acerophagus notativentris
Aenasius paulistus
Chrysoplatycerus splendens
Gyranusoidea advena
Leptomastidea abnormis
Leptomastix dactylopii

Tetracnemoidea peregrina
Zarhopalus corvinus
Puto ambiguous (Fullaway)
Anagyrus putonophilus
Puto barberi (Cockerell,)
Prochiloneurus dactylopii (H)
Puto simmondsiae McKenzie
Anagyrus yuccae **NEW** (UCRC)
Puto yuccae (Coquillett)
Aenasius maplei
Anagyrus putonophilus
Anagyrus yuccae
Radiococcus kelloggii (Carnes,)
Cheiloneurus lineascapus (H) **NEW** (EMEC)
Saccharicoccus sacchari (Cockerell)
Leptomastidea abnormis
Spilococcus atriplicis (Cockerell,)
Acerophagus pallidus
Spilococcus eriogoni (Ehrhorn)
Acerophagus pallidus
Spilococcus implicatus Ferris
Acerophagus angelicus
Anagyrus smithi
Cirrhencyrtus ehrhorni
Spilococcus pressus Ferris
Acerophagus abstrusus
Acerophagus californicus
Pseudleptomastix squammulata **NEW** (UCRC)
Spilococcus sequoiae (Coleman)
Cirrhencyrtus ehrhorni
Trabutina serpentinus (Green)
Anagyrus kamali
Trionymus aberrans Goux
Cheiloneurus elegans (H)

Psyllidae
Arytaina sp.
Prionomitus mitratus **NEW** (EMEC)
Cacopsylla americana (Crawford)
Prionomitus mitratus
Cacopsylla bidens (Šulc)
Trechnites insidiosus
Cacopsylla crataegi (Schrank)
Prionomitus mitratus
Cacopsylla sp. nr. *media* (Tuthill)
Prionomitus mitratus
Cacopsylla mali (Schmidberger)
Prionomitus mitratus
Prionomitus tiliaris
Cacopsylla melanoneura (Foerster)
Prionomitus mitratus
Prionomitus tiliaris
Cacopsylla peregrina (Foerster)
Prionomitus mitratus

Prionomitus tiliaris
Cacopsylla pyri (Linnaeus)
Prionomitus mitratus
Prionomitus tiliaris
Trechnites insidiosus
Cacopsylla pyricola (Foerster)
Prionomitus mitratus
Syrphophagus aphidivorus **NEW** (EMEC)
Trechnites insidiosus
Cacopsylla ribesiae (Crawford)
Prionomitus mitratus
Cacopsylla tenuata (Jensen)
Prionomitus tiliaris **NEW** (RLZC)
Syrphophagus aphidivorus **NEW** (RLZC)
Cacopsylla ulmi (Foerster)
Prionomitus tiliaris
Ceanothia essigi (Jensen)
Prionomitus mitratus
Ceanothia insolita (Tuthill)
Prionomitus mitratus
Creiis costatus (Froggatt)
Psyllaephagus bliteus
Cryptoneossa triangula Taylor
Psyllaephagus perplexus
Ctenarytaina eucalypti (Maskell)
Psyllaephagus pilosus
Ctenarytaina spatulata Taylor
Psyllaephagus pilosus **NEW** (UCDC)
Eucalyptolyma maideni Froggatt
Psyllaephagus parvus
Euglyptoneura fuscipennis (Crawford)
Prionomitus mitratus
Euglyptoneura minuta (Crawford)
Prionomitus mitratus
Euglyptoneura robusta (Crawford)
Prionomitus mitratus
Glycaspis brimblecombei Moore
Psyllaephagus bliteus
Glycaspis sp.
Psyllaephagus brachiatus
Psyllaephagus bliteus
Heteropsylla cubana Crawford
Syrphophagus aphidivorus (H)
Livilla retamae (Puton)
Prionomitus mitratus
Pachypsylla celtidisgemma Riley
Psyllaephagus pachypsyllae
Pachypsylla celtidisvesicula Riley
Psyllaephagus pachypsyllae
Pachypsylla venusta (Osten Sacken,)
Psyllaephagus pachypsyllae
Pexopsylla cercocarpi Jensen
Prionomitus mitratus

Psylla alni (Linnaeus,
Prionomitus mitratus **NEW** (UCRCC)
Psylla floccosa Patch
Prionomitus mitratus **NEW** (EMEC)
Psylla pyrisuga Foerster
Prionomitus mitratus
Trechnites insidiosus
Psylla sp.
Prionomitus mitratus **NEW** (EMEC)
Prionomitus tiliaris **NEW** (EMEC)
Trechnites insidiosus
Spondyliaspis sp.
Psyllaephagus parvus

Scutelleridae
Coleotichus blackburniae White
Ooencyrtus submetallicus

Triozidae
Bactericera cockerelli (Sulc)
Metaphycus psyllidis
Trioza beameri Tuthill
Prionomitus mitratus
Psyllaephagus pachypsyllae

Order HYMENOPTERA
Aphelinidae
Aphelinus asychis Walker
Syrphophagus aphidivorus
Aphelinus jucundus Gahan
Syrphophagus aphidivorus
Aphelinus maidis Timberlake
Syrphophagus aphidivorus
Aphelinus mali (Haldeman)
Syrphophagus aphidivorus
Aphelinus sanborniae Gahan
Syrphophagus aphidivorus
Aphelinus semiflavus Howard
Syrphophagus aphidivorus
Aphelinus varipes (Foerster)
Syrphophagus aphidivorus
Aphelinus sp.
Syrphophagus aphidivorus
Aphytis mytilaspidis (LeBaron)
Zaomma lambinus
Coccophagus ceroplastae (Howard)
Coccidoctonus dubius
Coccophagus merceti Hayat
Coccidoctonus dubius
Encarsia berlesei (Howard)
Zaomma lambinus

Apidae

Ceratina acantha Provancher
Coelopencyrtus hylaeoleter
Ceratina punctigena Cockerell
Coelopencyrtus hylaeoleter
Ceratina sp.
Coelopencyrtus hylaeoleter

Braconidae

Aphidius avenae Haliday
Syrphophagus aphidivorus
Aphidius ervi Haliday
Syrphophagus aphidivorus
Aphidius smithi Sharma & Subba Rao
Syrphophagus aphidivorus
Aphidius sonchi Marshall
Syrphophagus aphidivorus
Aphidius sp
Syrphophagus aphidivorus
Binodoxys communis (Gahan)
Syrphophagus aphidivorus
Binodoxys indicus (Subba Rao & Sharma)
Syrphophagus aphidivorus
Cotesia melanoscela (Ratzeburg)
Ooencyrtus kuvanae
Diaeretiella rapae (M'Intosh)
Syrphophagus aphidivorus
Ephedrus lacertosus (Haliday)
Syrphophagus aphidivorus
Ephedrus persicae Froggatt
Syrphophagus aphidivorus
Lysiphlebus dissolutus (Nees)
Syrphophagus aphidivorus
Lysiphlebus fabarum (Marshall)
Syrphophagus aphidivorus
Lysiphlebus testaceipes (Cresson)
Syrphophagus aphidivorus
Monoctonus caricis (Haliday)
Syrphophagus aphidivorus
Praon exsoletum (Nees)
Syrphophagus aphidivorus
Praon volucre (Haliday)
Syrphophagus aphidivorus
Praon sp.
Syrphophagus aphidivorus
Trioxys complanatus Quilis
Syrphophagus aphidivorus
Trioxys curvicaudus Mackauer
Syrphophagus aphidivorus
Trioxys pallidus (Haliday)
Syrphophagus aphidivorus

Colletidae
Hylaeus ellipticus (Kirby)
Coelopencyrtus hylaeoleter
Hylaeus sp.
Coelopencyrtus hylaeoleter

Dryinidae
Echthrodelphax fairchildii Perkins
Cheiloneurus flaccus
Haplogonatopus vitiensis Perkins
Cheiloneurus flaccus
Pseudogonatopus hospes Perkins
Cheiloneurus flaccus

Encyrtidae
Anagyrus diversicornis (Howard)
Prochiloneurus dactylopii
Anagyrus lopezi (DeSantis)
Prochiloneurus dactylopii
Anagyrus yuccae
Prochiloneurus modestus
Anicetus beneficus Ishii & Yasumatsu
Coccidoctonus dubius
Diversinervus elegans Silvestri
Cheiloneurus inimicus **NEW** (UCRC)
Cheiloneurus noxius
Encyrtus infelix (Embleton)
Coccidoctonus dubius
Homalotylus affinis Timberlake
Cheiloneurus banksi **NEW** (EMEC)
Isodromus iceryae Howard
Cheiloneurus compressicornis
Isodromus niger Ashmead
Cheiloneurus compressicornis
Metaphycus flavus (Howard)
Eusemion longipenne
Metaphycus lounsburyi (Howard)
Ammonoencyrtus californicus
Cheiloneurus inimicus
Cheiloneurus lineascapus
Cheiloneurus noxius
Coccidoctonus dubius
Metaphycus luteolus (Timberlake)
Cheiloneurus noxius
Metaphycus physokermis (Timberlake)
Cheiloneurus inimicus
Metaphycus stanleyi Compere
Cheiloneurus noxius
Metaphycus varius (Girault)
Coccidoctonus dubius
Microterys nietneri (Motschulsky)
Ammonoencyrtus californicus
Cheiloneurus inimicus **NEW** (UCRC)
Cheiloneurus noxius

Coccidoctonus dubius
Eusemion longipenne
Paraphaenodiscus subterraneus Ferrière
Cheiloneurus elegans
Pseudhomalopoda prima Girault
Zaomma lambinus
Pseudococcobius sp.
Cheiloneurus banksi
Psyllaephagus pistaciae Ferriere
Syrphophagus aphidivorus
Psyllaephagus yaseeni Noyes
Syrphophagus aphidivorus
Thomsonica amathus (Walker)
Zaomma lambinus
Zarhopalus corvinus (Girault)
Prochiloneurus modestus

Eupelmidae
Anastatus japonicus Ashmead
Ooencyrtus kuvanae

Ichneumonidae
Gelis tenellus (Say)
Cheiloneurus compressicornis

Perilampidae
Perilampus chrysopae Crawford
Cheiloneurus compressicornis

Platygastridae
Platygaster zosine Walker
Cheiloneurus elegans

Pteromalidae
Moranila californica (Howard)
Coccidoctonus dubius
Scutellista caerulea (Fonscolombe)
Coccidoctonus dubius

Order LEPIDOPTERA
Arctiidae
Hypercompe albicornis (Grote)
Ooencyrtus submetallicus

Argyresthiidae
Argyresthia aureoargentella Brower
Copidosoma deceptor

Blastobasidae
Holcocera modestella Clemens
Copidosoma albipes

Coleophoridae
Coleophora ulmifoliella McDunnough

Copidosoma bucculatricis
Coleophora viburniella Clemens
Copidosoma albipes

Gelechiidae
Anacampsis innocuella (Zeller)
Copidosoma albipes
Anacampsis niveopulvella (Chambers)
Copidosoma albipes
Copidosoma howardi
Anacampsis populella (Clerck)
Copidosoma albipes
Anarsia eleagnella Kusnetzov
Copidosoma varicorne
Anarsia ephippias (Meyrick)
Copidosoma varicorne
Anarsia lineatella Zeller
Copidosoma pyralidis
Copidosoma varicorne
Anarsia sagmatica Meyrick
Copidosoma varicorne
Anarsia spartiella (Schrank)
Copidosoma varicorne
Anarsia sp.
Copidosoma varicorne
Aroga eleagnella (Chambers)
Copidosoma vagum
Battaristis vittella (Busck)
Copidosoma deceptor
Chionodes kubai Hodges
Copidosoma vagum **NEW** (CSCA)
Coleotechnites apicitripunctella (Clemons)
Copidosoma deceptor
Coleotechnites atrupictella (Dietz)
Copidosoma gelechiae
Coleotechnites canusella (Freeman)
Copidosoma deceptor
Coleotechnites huntella (Keiffer)
Copidosoma deceptor
Coleotechnites milleri (Busck)
Copidosoma deceptor
Coleotechnites moreonella Heinrich
Copidosoma deceptor
Coleotechnites piceaella Kearfott
Copidosoma deceptor
Coleotechnites starki Freeman
Copidosoma deceptor
Coleotechnites thujaella (Kearfott)
Copidosoma bucculatricis
Copidosoma deceptor
Coleotechnites spp.
Copidosoma deceptor
Compsolechia anisogramma (Meyrick)
Copidosoma varicorne

Dichromeris eridantis (Meyrick)
Copidosoma varicorne
Dichomeris flavocostella (Clemons)
Copidosoma pyralidis
Dichomeris setosella (Clemons)
Copidosoma pyralidis
Exoteleia dodecella (Linnaeus)
Copidosoma deceptor
Copidosoma filicorne
Exoteleia nepheos Freeman
Copidosoma deceptor
Copidosoma filicorne
Exoteleia pinifoliella (Chambers)
Copidosoma deceptor
Filatima pseudacaciella (Chambers)
Copidosoma vagum
Gelechia lynceella Zeller
Copidosoma howardi
Gelechia turpella (Denis & Schiffermüller)
Copidosoma albipes
Gelechia sp.
Copidosoma howardi
Copidosoma vagum
Gnorimoschema gallaeasterella (Kellicott)
Copidosoma gelechiae
Gnorimoschema gallaesolidaginis (Riley)
Copidosoma gelechiae
Gnorimoschema gibsoniella Busck
Copidosoma gelechiae
Gnorimoschema salinaris Busck
Copidosoma gelechiae
Gnorimoschema gudmanella (Walsingham)
Copidosoma capsicum
Gnorimoschema sp.
Copidosoma gelechiae
Phthorimaea operculella (Zeller)
Copidosoma capsicum
Copidosoma koehleri
Recurvaria sp.
Copidosoma deceptor
Scrobipalpa absoluta (Meyrick)
Copidosoma koehleri
Symmetrischema capsica (Bradley & Polovný)
Copidosoma capsicum
Symmetrischema tangolias (Geyen)
Copidosoma koehleri

Geometridae
Cosmorhoe ocellata (Linnaeus)
Copidosoma cervius
Eupithecia abietaria (Goeze)
Copidosoma cervius
Eupithecia analoga Diakonoff
Copidosoma cervius

Eupithecia assimilata Doubleday
Copidosoma cervius
Eupithecia centaureata (Denis & Schiffermüller)
Copidosoma cervius
Eupithecia. expallidata Doubleday
Copidosoma cervius
Eupithecia gueneata Millière
Copidosoma cervius
Eupithecia haworthiata (Doubleday)
Copidosoma cervius
*Eupithecia innotata (*Hufnagel)
Copidosoma cervius
Eupithecia laricata (Freyer)
Copidosoma cervius
Eupithecia linariata (Denis & Schiffermüller)
Copidosoma cervius
Eupithecia pimpinellata (Hübner)
Copidosoma cervius
Eupithecia pusillata (Denis & Schiffermüller)
Copidosoma cervius
Eupithecia rosmarinata Millière
Copidosoma cervius
Eupithecia simpliciata (Haworth)
Copidosoma cervius
Eupithecia succenturiata (Linnaeus)
Copidosoma cervius
Eupithecia tripunctaria Herrich-Schäffer
Copidosoma cervius
Eupithecia ?*trisignaria* Herrich-Schäffer
Copidosoma cervius
Eupithecia unedonata (Mabille)
Copidosoma cervius
Eupithecia vulgata (Haworth)
Copidosoma cervius
Eupithecia spp.
Copidosoma cervius
Perizoma affinitata (Stephens)
Copidosoma cervius
Perizoma bifasciatum (Haworth)
Copidosoma cervius

Gracillariidae
Caloptilia sp.
Ageniaspis bicoloripes
Cameraria caryaefoliella (Clemens)
Ageniaspis bicoloripes
Cameraria cincinnatiella (Chambers)
Ageniaspis bicoloripes
Cameraria diabloensis Opler & Davis
Ageniaspis bicoloripes
Cameraria gaultheriella (Walsingham)
Ageniaspis bicoloripes
Cameraria hamameliella(Busck)
Ageniaspis bicoloripes **NEW** (EMEC)

Cameraria quercivorella (Chambers)
Ageniaspis bicoloripes **NEW** (EMEC)
Cameraria ulmella Chambers
Ageniaspis bicoloripes
Cameraria sp. prob. *wislizeniella* Opler
Ageniaspis bicoloripes
Cameraria sp.
Ageniaspis bicoloripes
Parablastothrix nearctica **NEW** (EMEC)
Marmara fraxinicola Braun
Ageniaspis bicoloripes
Phyllonorycter inusitatella (Braun)
Ageniaspis sp. nr. *bicoloripes* **NEW** (EMEC)
Phyllonorycter rileyella (Chambers)
Ageniaspis bicoloripes **NEW** (EMEC)
Phyllonorycter sandraella (Opler)
Parablastothrix nearctica
Phyllonorycter sp.
Ageniaspis bicoloripes

Heliozelidae
Coptodisca powellella Opler
Parablastothrix nearctica
Coptodisca sp.
Parablastothrix nearctica

Hepialidae
Hepialus humuli (Linnaeus)
Copidosoma truncatellum

Lasiocampidae
Dendrolimus spectabilis (Butler)
Ooencyrtus kuvanae
Malacosoma californicum (Packard)
Ooencyrtus sp.
Malacosoma neustria (Linnaeus)
Ooencyrtus kuvanae
Malacosoma sp.
Ooencyrtus sp.

Lymantriidae
Dasychira pinicola (Dyar)
Ooencyrtus kuvanae
Euproctis chrysorrhoea (Linnaeus)
Ooencyrtus kuvanae
Leucoma salicis (Linnaeus)
Ooencyrtus kuvanae
Lymantria fumida Butler
Ooencyrtus kuvanae
Lymantria monacha (Linnaeus)
Ooencyrtus kuvanae
Lymantria xylina Swinhoe
Ooencyrtus kuvanae
Orgyia antiqua (Linnaeus)

Ooencyrtus kuvanae
Orgyia leucostigma (Smith)
Ooencyrtus kuvanae
Orgyia sp.
Ooencyrtus kuvanae
Porthetria dispar (Linnaeus)
Ooencyrtus kuvanae

Lyonetiidae
Bucculatrix albertiella Busck
Parablastothrix nearctica

Nepticulidae
Nepticula rhamnicola (Braun)
Parablastothrix nearctica **NEW** (EMEC)
Nepticula sp.
Parablastothrix nearctica **NEW** (EMEC)
Obrussa sp.
Parablastothrix nearctica
Stigmella variella (Braun)
Parablastothrix nearctica
Stigmella inconspicuella
Ageniaspis bicoloripes
Stigmella sp.
Ageniaspis bicoloripes
Parablastothrix nearctica **NEW** (EMEC)

Noctuidae
Actinotia polyodon (Clerck)
Copidosoma truncatellum
Agrapha agnata (Staudinger)
Copidosoma floridanum
Agrapha tarassota (Hampson)
Copidosoma floridanum
Agrotis ipsilon (Hufnagel)
Copidosoma celaenae **NEW** (EMEC)
Tyndarichus americanus (H) **NEW** (EMEC)
Agrotis malefida Guenée
Copidosoma truncatellum
Agrotis orthogonia Morrison
Copidosoma bakeri
Copidosoma celaenae
Agrotis venerabilis Walker
Copidosoma bakeri
Agrotis sp.
Copidosoma celaenae **NEW** (UCRC)
Copidosoma truncatellum
Anomis erosa Hübner
Copidosoma truncatellum
Apamea devastator (Brace)
Copidosoma bakeri
Apamea monoglypha (Hufnagel)
Copidosoma truncatellum
Apamea sublustris (Esper)

Copidosoma truncatellum
Argyrogramma signatum (Fabricius)
Copidosoma floridanum
Autographa californica (Speyer)
Copidosoma floridanum
Autographa gamma (Linnaeus)
Copidosoma floridanum
Autographa sp.
Copidosoma floridanum
Autoplusia egena (*Gueneé*,)
Copidosoma floridanum **NEW** (CSCA)
Autoplusia olivacea (Skinner)
Copidosoma floridanum **NEW** (LACM)
Catocala electa (Vieweg)
Copidosoma truncatellum
Chrysodeixis acuta (Walker)
Copidosoma floridanum
Chrysodeixis argentifera (Guenée)
Copidosoma floridanum
Chrysodeixis chalcites (Esper)
Copidosoma floridanum
Chrysodeixis eriosoma (Doubleday)
Copidosoma floridanum
Chrysodeixis sp.
Copidosoma floridanum
Euchalcia modestoides Poole
Copidosoma floridanum
Eupsilia sp.
Copidosoma celaenae
Euxoa auxiliaris (Grote)
Copidosoma bakeri
Euxoa declarata (Walker)
Copidosoma celaenae
Euxoa detersa (Walker)
Copidosoma bakeri
Euxoa flavicollis (Smith)
Copidosoma bakeri
Euxoa intrita (Morrison)
Copidosoma bakeri
Euxoa lidia (Stoll)
Copidosoma bakeri
Copidosoma truncatellum
Euxoa messoria (Harris)
Copidosoma bakeri
Copidosoma celaenae
Euxoa obelisca (Denis & Schiffermüller)
Copidosoma truncatellum
Euxoa ochrogaster (Guerneé)
Copidosoma bakeri
Copidosoma celaenae
Euxoa perpolita (Morrison)
Copidosoma celaenae
Euxoa scandens (Riley)
Copidosoma bakeri

Euxoa scolastica McDunnough
Copidosoma celaenae
Copidosoma celaenae
Euxoa temera (Hübner)
Copidosoma truncatellum
Euxoa tristicula (Morrison)
Copidosoma bakeri
Copidosoma celaenae
Euxoa sp.
Copidosoma bakeri
Copidosoma truncatellum
Feltia jaculifera (Guerneé)
Copidosoma bakeri
Copidosoma celaenae
Feltia subgothica (Haworth)
Copidosoma bakeri
Feltia sp.
Copidosoma bakeri
Hadena luteago (Denis & Schiffermüller)
Copidosoma truncatellum
Lacinipolia renigera (Stephens)
Copidosoma bakeri
Copidosoma celaenae
Lamprotes c-aureum (Knoch)
Copidosoma floridanum
Mamestra brassicae (Linnaeus)
Copidosoma floridanum
Copidosoma truncatellum
Mocis latipes Guenée
Copidosoma truncatellum
Nebrarctia obliqua (Walker)
Copidosoma floridanum
*Peridroma saucia (*Hübner)
Copidosoma bakeri
Copidosoma celaenae
Plusia festucae (Linnaeus)
Copidosoma floridanum
Plusia sp.
Copidosoma floridanum
Polia purpurissata
Copidosoma celaenae
Polychrysia moneta (Fabricius)
Copidosoma floridanum
Protolampra rufipectus (Morrison)
Copidosoma celaenae
Pseudoplusia includens (Walker)
Copidosoma floridanum
Rachiplusia nu (Guenée)
Copidosoma bakeri
Copidosoma floridanum
Rachiplusia ou (Guenée)
Copidosoma floridanum
Rhynchagrotis cupida (Grote)
Copidosoma celaenae

Spodoptera ornithogalli (Guenée)
Copidosoma truncatellum
Spodoptera sp.
Copidosoma truncatellum
Syngrapha epigaea (Grote)
Copidosoma floridanum
Thysanoplusia orichalcea (Fabricius)
Copidosoma floridanum
Thysanoplusia intermixta (Warren)
Copidosoma floridanum
Trichoplusia ni (Hübner)
Copidosoma floridanum
Copidosoma bakeri
Xestia diatrapezium (Denis & Schiffermüller)
Copidosoma truncatellum
Xestia mustelina (Smith)
Copidosoma celaenae
Xestia smithii (Snellen)
Copidosoma bakeri

Notodontidae
Notodonta ziczac (Linnaeus)
Copidosoma truncatellum
Phryganidia californica Packard
Lamennaisia ambigua **NEW** (CAS)

Nymphalidae
Caligo memnon (Felder & Felder)
Ooencyrtus submetallicus
Heliconius sp.
Ooencyrtus submetallicus
Opsiphanes cassina Felder & Felder
Ooencyrtus submetallicus
Opsiphanes tamarindi (Felder & Felder)
Ooencyrtus submetallicus

Oecophoridae
Hofmannophila pseudospretella (Stainton)
Copidosoma vagum

Pyralidae
Amyelois transitella (Walker)
Copidosomopsis plethorica
Apomyelois ceratoniae (Zeller)
Copidosomopsis plethorica
Diatraea sp.
Copidosoma capsicum
Ephestia kuehniella Zeller
Copidosomopsis tanytmemus
Lineodes sp.
Copidosoma capsicum

Saturniidae
Eriogyna pyretorum (Westwood)

Ooencyrtus kuvanae
Hemileuca oliviae Cockerell
Ooencyrtus kuvanae

Sesiidae
Pennisetia marginata (Harris)
Ooencyrtus californicus

Sphingidae
Erinnyis ello (Linnaeus)
Ooencyrtus submetallicus

Tortricidae
Acleris hippophaeana (Heyden)
Copidosoma varicorne
Acleris variana (Fernald)
Copidosoma deceptor
Acleris sp.
Copidosoma howardi
Apotomis sp.
Copidosoma howardi
Archips fumiferana (Clemons)
Copidosoma filicorne
Archips sp.
Copidosoma howardi
Argyrotaenia quercifoliana Fitch
Copidosoma vagum
Choristoneura conflictana (Walker)
Copidosoma albipes
Cydia caryana (Fitch)
Copidosomopsis plethorica
Cydia funebrana Treitschke
Copidosoma varicorne
Cydia molesta (Busck)
Copidosoma varicorne
Cydia pomonella (Linnaeus)
Copidosoma varicorne
Cydia sp.
Copidosoma varicorne
Epiblema scudderiana (Clemens)
Copidosoma gelechiae
Epinotia nanana (Treitschke)
Copidosoma deceptor
Epinotia solandriana (Linnaeus)
Copidosoma albipes
Eucosma sp.
Copidosoma varicorne
Gypsonoma minutana (Hübner)
Copidosoma varicorne
Lobesia incultana (Walker)
Copidosoma varicorne
Pandemis canadana Kearfott
Copidosoma howardi
Pseudosciaphila duplex (Walsingham)

Copidosoma albipes
Rhyacionia buoliana (Denis & Schiffermüller)
Copidosoma filicorne
Rhyacionia frustrana (Comstock)
Copidosoma filicorne
Tortrix viridana (Linnaeus)
Copidosoma varicorne

Yponomeutidae
Argyresthia aureoargentella Brower
Copidosoma bucculatricis
Argyresthia freyella Walsingham
Copidosoma bucculatricis
Argyresthia libocedrella Busck
Copidosoma bucculatricis
Argyresthia thuiella (Packard)
Copidosoma bucculatricis

Order NEUROPTERA
Chrysopidae
Ceraeochrysa cubana (Hagen)
Cheiloneurus compressicornis (H)
Isodromus iceryae
Ceraeochrysa lateralis (Guérin-Méneville)
Isodromus iceryae
Ceraeochrysa sanchezi (Navás)
Cheiloneurus compressicornis (H)
Isodromus iceryae
Ceraeochrysa valida (Banks)
Cheiloneurus compressicornis (H)
Isodromus iceryae
Chrysopa nigricornis Burmeister
Cheiloneurus compressicornis (H)
Isodromus iceryae
Isodromus niger
Chrysopa oculata Say
Cheiloneurus compressicornis (H)
Isodromus niger
Chrysopa pallens (Rambur)
Isodromus niger
Chrysopa sp.
Isodromus puncticeps
Chrysoperla carnea (Stephens)
Isodromus niger
Ooencyrtus kuvanae
Chrysoperla plorabunda (Fitch)
Cheiloneurus compressicornis (H)
Isodromus iceryae
Chrysoperla rufilabris (Burmeister)
Cheiloneurus compressicornis (H)
Isodromus iceryae
Eremochrysa punctinervis (McLachlan)
Isodromus iceryae
Leucochrysa floridana Banks

Isodromus iceryae
Suarius fedtschenkoi (McLachlan)
Ooencyrtus kuvanae

Coniopterygidae
Conwentzia barretti (Banks)
Trjapitzinellus microrphanos **NEW** (EMEC)
Conwentzia sp.
Trjapitzinellus microrphanos
Parasemidalis sp.
Trjapitzinellus microrphanos
Undetermined
Aphycaspis sp. **NEW** (UCRC)

Hemerobiidae
Hemerobius pacificus Banks
Echthroplexis planiformis
Sympherobius angustus (Banks)
Isodromus iceryae
Isodromus niger
Sympherobius californicus Banks
Hexacnemus armitagei
Isodromus iceryae
Sympherobius sp.
Hexacnemus armitagei

Order ACARI
Ixodidae
Amblyomma tholloni Neumann
Ixodiphagus hookeri
Amblyomma variegatum (Fabricius)
Ixodiphagus hookeri
Dermacentor andersoni Stiles
Ixodiphagus hookeri
Dermacentor nitens Neumann
Ixodiphagus hookeri
Dermacentor parumapertus Neumann
Ixodiphagus hookeri
Dermacentor variabilis (Say)
Ixodiphagus hookeri
Dermacentor sp.
Ixodiphagus hookeri
Haemaphysalis bispinosa Neumann
Ixodiphagus hookeri
Haemaphysalis concinna Koch
Ixodiphagus hookeri
Haemaphysalis inermis Birula
Ixodiphagus hookeri
Haemaphysalis japonica Warburton
Ixodiphagus hookeri
Haemaphysalis leachei (Audouin)
Ixodiphagus hookeri
Haemaphysalis lepoispalustris (Packard)
Ixodiphagus hookeri

Hyalomma aegyptium (Linnaeus)
Ixodiphagus hookeri
Hyalomma anatolicum Koch
Ixodiphagus hookeri
Hyalomma asiaticum Schulze & Schlottke
Ixodiphagus hookeri
Hyalomma sp.
Ixodiphagus hookeri
Ixodes crenulatus Koch
Ixodiphagus hookeri
Ixodes dentatus Marx
Ixodiphagus hookeri
Ixodes hexagonus Leach
Ixodiphagus hookeri
Ixodes marmotae Cooley & Kohls
Ixodiphagus hookeri
Ixodes muris Bishopp & Smith
Ixodiphagus hookeri
Ixodes persulcatus Schulze
Ixodiphagus hookeri
Ixodes ricinus (Linnaeus)
Ixodiphagus hookeri
Ixodes scapularis Say
Ixodiphagus hookeri
Ixodes texanus Banks
Ixodiphagus hookeri
Ixodes sp.
Ixodiphagus hookeri
Rhipicephalus appendiculatus Neumann
Ixodiphagus hookeri
Rhipicephalus evertsi Neumann
Ixodiphagus hookeri
Rhipicephalus oculatus Neumann
Ixodiphagus hookeri
Rhipicephalus sanguineus (Latreille)
Ixodiphagus hookeri
Rhipicephalus sp.
Ixodiphagus hookeri

APPENDIX II. **Taxa previously reported from California under invalid names.**

Aenasioidea armitagei Compere 1926a
Now placed in *Metaphycus*
Aenasioidea kermicola Timberlake 1916
Now placed in *Metaphycus*
Anarhopus sydneyensis Timberlake 1929
Now placed in *Tetracnemoidea*
Anisotylus similis utahensis Timberlake 1919c
Now placed in *Homalotylus*
Anusia neomexicana Ashmead 1900
Now placed in *Formicencyrtus*
Apoanagyrus californicus Compere 1947
Now placed in *Anagyrus*

Apterencyrtus microphagus (Mayr 1876)
Junior synonym of *Zaomma lambinus*
Arhopoideus peregrinus (Compere 1939b)
Now placed in *Tetracnemoidea*
Arhopoideus pretiosus (Timberlake 1929)
Junior synonym of *Tetracnemoidea brevicornis*
Caenocercus planiformis (Howard 1895a)
Now placed in *Echthroplexis*
Chalcaspis arizonensis Girault 1915b
Now placed in *Aenasius*
Chalcaspis phenacocci (Ashmead 1902)
Now placed in *Aenasius*
Cerchysius hubbardii Ashmead 1900
Now placed in *Tineophoctonus*
Chrysopophagus amplicornis (Gahan 1914)
Synonymized under *Cheiloneurus banksi* by Trjapitzin & Zuparko (2005)
Chrysopophagus compressicornis Ashmead 1894
Now placed in *Cheiloneurus*
Encyrtus albicoxa (Ashmead 1885)
Junior synonym of *Encyrtus aurantii*
Encyrtus barbatus Timberlake 1919b
Junior synonym of *Encyrtus aurantii*
Encyrtus bicolor (Howard 1881)
Junior synonym of *Encyrtus aurantii*
Encyrtus californicus (Girault 1917d)
Junior synonym of *Encyrtus fuscus*
Erythraphycus argyrocomus Compere 1947
Now placed in *Metaphycus*
Erythraphycus calvus Compere 1947
Now placed in *Metaphycus*
Erythraphycus matteolus Compere 1947
Now placed in *Metaphycus*
Hunterellus hookeri Howard 1908
Now placed in *Ixodiphagus*
Leptomastidea claripennis (Timberlake 1918)
Now placed in *Gyranusoidea*
Melanaphycus clauseni (Timberlake 1918)
Now placed in *Metaphycus*
Melanaphycus fumipennis (Timberlake 1918)
Now placed in *Metaphycus*
Melanaphycus fuscipennis (Howard 1898a)
Now placed in *Metaphycus*
Microterys claripennis Compere 1928
Now placed in *Metablastothrix*
Microterys dubiosus (Dalla Torre 1898)
Junior synonym of *Lamennaisia ambigua*
Microterys flavus (Howard 1881)
Junior synonym of *Microterys nietneri*
Microterys titiani Girault 1917a
Junior synonym of *Microterys sylvius*
Paralitomastix pyralidis (Ashmead 1888)
Now placed in *Copidosoma*
Paranusia sp.

An unidentified species was recorded from California in Gordh (1979); the genus was synonymized with *Anagyrus* by Noyes (1980), although Kerrich (1982) maintained them separately

Parasyrpophagus sp.

Junior synonym of *Exoristobia*

Pauridia peregrina Timberlake 1919b

Junior synonym of *Coccidoxenoides perminutus*

Pentalitomastix plethoricus Caltagirone 1966

Now placed in *Copidosomopsis*

Psyllaephagus arbuticola Gahan & Waterston 1926

Now placed in *Ginsiana*

Quaylea whittieri (Girault 1918)

Junior synonym of *Coccidoctonus dubius*

Trechnites psyllae (Ruschka 1923)

Junior synonym of *Trechnites insidiosus*

APPENDIX III.

Taxa either mistakenly reported from California, or introduced into the state without evidence of long-term establishment.

Acerophagus mundus (Gahan 1946) (*Pseudaphycus*). This species was used in a 1944 biocontrol program against *Pseudococcus longispinus*. Although the parasitoid was able to attack the mealybug in the lab, it failed to establish (Bartlett 1978b).

Acerophagus perdignus (Compere & Zinna 1955) (*Pseudaphycus*). This species was imported from Eritrea in 1953 in a biocontrol program against *Planococcus citri*, and released in San Diego and Santa Barbara Counties (Clausen 1955). Gordh (1979) noted it was "possibly established", but I have found no evidence that it was ever recovered.

Aenasius advena Compere 1937. This species was imported from Mexico in 1966–67 in a biocontrol program against *Ferrisia virgata* in Imperial County, but it failed to establish (DeBach & Warner 1969).

Aenasius paulistus Compere 1937. This species was imported from Brazil in 1934 into California in a biocontrol program against *Pseudococcus maritimus*, but it died out in culture (Flanders 1940a).

Aloencyrtus niloticus (Compere 1940b) (*Coccidoxenus*). This species was imported from Kenya in 1937 in a *Saissetia oleae* biocontrol program, but it failed to establish (Bartlett 1978a).

Aloencyrtus saissetiae (Compere 1939a) (*Microterys*). This species was imported during two *Saissetia oleae* biocontrol programs (from Uganda in 1937 and South Africa in 1979), but it failed to establish (Bartlett 1978; Daane et al. 1991). The report of successful establishment by Lampson & Morse (1992) appears to be in error.

Anagyrus fujikona Tachikawa, 1963. The type deposition is unknown, but is probably at either Kyushu University (Fukuoka, Japan) or Ehime University (Matsuyama, Japan). It was imported from Japan in a biocontrol program against *Pseudococcus comstocki* and released in Tulare County in 1974, but apparently failed to establish (Meyerdirk & Newell 1979).

Anagyrus fusciventris (Girault 1915a) (*Epidinocarsis*). This species was imported from Hawaii (presumably previously established there from Australia) in 1936 in a biocontrol program against *Pseudococcus longispinus*, but it has not been recovered since 1939 (Flanders 1940b; Bartlett 1978b).

Anagyrus kivuensis Compere 1939a. This species was imported in a biocontrol program against *Pseudococcus maritimus* from Kenya in 1948, and again in 1953, but it failed to establish (Bartlett 1978b), although it did have some success in greenhouses (Doutt 1951). Trjapitzin (1989) considered this species a junior synonym of his concept of *A. pseudococci* Girault, a taxon that Triapitsyn et al. (2014) treated as *A.* sp. nr. *pseudococci*, and became established in California in 1955.

Anagyrus subalbipes Ishii 1928. This species was imported from Japan in 1973 in a biocontrol program against *Pseudococcus comstocki* and released in Tulare County, but it failed to establish (Meyerdirk & Newell 1979).

Anthemus inconspicuus Doutt 1966. This species was imported from Pakistan and released in a biocontrol program against *Parlatoria oleae* in 1957, and initially established in several locations (Contra Costa, Fresno and Tulare counties). However, it apparently was outcompeted by *Coccophagoides utilis* Doutt 1966, and had disappeared by 1961 (Rosen & DeBach 1978).

Blastothrix sericea (Dalman 1820) (*Encyrtus*). See remarks under *B*. sp. nr. *britannica*. This is a Palearctic species, which was reported established in British Columbia in the late 1920s, but Sugonjaev (1983) reports that this was a misidentification of *B*. *britannica*. Subsequent reports of *B*. *sericea* from the Pacific Northwest and northern California are probably referrable to *B*. *britannica* or *B*. *americana*. In 1939, a species then identified as *B*. *sericea* was released in California in a biocontrol effort against *Parthenolecanium corni* (Bouché), but that species evidently never established (Bartlett 1978a: 62–63). Due to previous misidentifications, Sugonjaev (1983: 147) considers *B*. *sericea* may be monophagous on *E*. *tiliae*, although more recent references list many hosts for this species (Noyes 2001). Ashmead (1900: 390) reported *B*. *sericea* from North America, but he may have been referring to *B*. *longipennis*, which he placed as a junior synonym. Slosson (1906: 323), Simanton (1916: 66) and Viereck (1916: 502) reported *B*. *sericea* from the northeastern United States early in the 20th century: these records may represent an adventitive New World establishment of *B*. *sericea*, but I suspect they were misidentifications. Interestingly, Viereck's host record ("Reared from *Phenacoccus acericola* parasitized by *Baccha fascipennis*") led to later catalogs recording the latter (a syrphid fly) as a (albeit questionable) host.

Blepyrus insularis (Cameron 1886) (*Encyrtus*). This species was imported from Mexico in 1966–67 in biocontrol program against *Ferrisia virgata* and released in Imperial County, but failed to establish (DeBach & Warner 1969).

Blepyrus saccharicola Gahan 1942. This species was imported from the southern USA in 1952 in a biocontrol program against *Pseudococcus longispinus*, but failed to establish (Bartlett 1978b).

Bothriocraera bicolor Compere & Zinna 1955. This species was imported from Trinidad, reared on *Ferrisia virgata* and released in California during a series of biocontrol programs from 1952–1954 against *Planococcus citri*, *Pseudococcus longispinus* and *P*. *maritimus*, with no record of successful establishment (Bartlett 1978b).

Choreia inepta (Dalman 1820) (*Encyrtus*). This is a Palearctic species, mistakenly listed from the USA (Virginia & California) in Noyes (2001), through confusion of a junior synonym (*Choreia nigroaenea* Westwood) with *Spalangia nigroaenea* Curtis (Hymenoptera: Pteromalidae). This carried over into the host listing, and all the Diptera (Muscidae & Fanniidae) in Noyes' listing is properly attributable to *S*. *nigroaenea*.

Chrysoplatycerus flavicollis (De Santis 1972) (*Encyrtolophus*). This species was imported from Paraguay, presumably in the early 1970s, and reared in an insectary in Tulare county (as *Paraplatycerus citriculus* Hall) as part of a biocontrol program against *Pseudococcus comstocki* (Hall 1974). There is no record in the literature that it was ever released.

Clausenia purpurea Ishii 1923. This species was released in Tulare County in a biocontrol program against *Pseudococcus comstocki* in 1967, where it was initially recovered, but apparently failed to establish (Meyerdirk & Newell 1979).

Coccidencyrtus ensifer (Howard 1885) (*Encyrtus*). This species was originally recorded from "*Aspidiotus corticalis*" (a Riley MSS name) on peach—the true identity of this scale is unknown. *Coccidencyrtus ensifer* occurs throughout the eastern United States (Noyes 2001), and its reported presence in California appears to be based on a single record by Essig (1915). However, Essig did not specifically state that *C*. *ensifer* occurs in California—he simply noted that *Diaspidiotus juglansregiae* is common throughout the southern portion of the state, and that *C*. *ensifer* (among several other species) has been reared from the scale. I have not found any other original record of this species from California, and therefore conclude that it is not present in the state, and that Essig's statement was referring to host records from the eastern part of the country.

Comperiella unifasciata Ishii 1925. Trjapitzin (1989: 296) and Noyes & Hayat (1994: 407) report that this species was introduced into California as a biological control agent. However, although Compere (1926b: 49) redescribed this species from specimens in the Citrus Experiment Station (now the University of California, Riverside) sent there from Japan, there is no record that any releases were attempted.

Copidosoma desantisi Annecke & Mynhardt 1974. This species was originally introduced (as *C*. *koehleri*) into California in the 1940s from Chilean stock in a biocontrol program against *Phthorimaea operculella* (Zeller), but failed to establish (Oatman 1978). The species has been reported from California (Noyes 2001), but this was based on insectary records (Annecke & Mynhardt 1974: "Albany" refers to the University of California's, Berkeley, Biological Control facility), not field-collected specimens.

Discodes aeneus (Dalman 1820) (*Encyrtus*). This was one of a suite of species imported from Europe for control of *Parthenolecanium corni*, but there is no record that it ever became established (Barlett 1978a).

Diversinervus smithi Compere 1940b. This species was imported from South Africa in 1937 for control of *Saissetia oleae*, and was released in southern California but failed to establish (Bartlett 1978a).

Ectroma n. sp. nr. *annulicorne* Trjapitzin 1972. Trjapitzin & Triapitsyn (2007) reported a single female specimen (CAS) "near Francis Lake in Sierra Nevada, California" (the complete collecting label actually reads "CAL Inyo Co.,

Tecopa, alkaline N. Francis (or Grimshaw) Lake 24 III 1964 H.B. Leech"). I have examined this specimen, and it belongs to an undescribed genus (as determined by J. Noyes), close to *Discodes*, which occurs from southern California north to Stanislaus County.

Encyrtus fuliginosus Compere 1940b. This species was imported from South Africa in 1937 and released in southern California for the biocontrol of *Saissetia oleae*, but it failed to establish (Bartlett 1978a).

Encyrtus infidus (Rossi 1790) (*Chrysis*). In 1953, a species tentatively identified as *E. infidus* was introduced from Japan in a biocontrol program against *Eulecanium kunoense* and released in Contra Costa County (Clausen 1955). A single individual collected in Contra Costa County in June 1953 (EMEC) represents the only specimen recovered.

Gyranusoidea pseudococci (Brèthes 1924) (*Leptomastidea*). This species was imported from Mexico in 1966–67 in a biocontrol program against *Ferrisia virgata* in Imperial County, but it failed to establish (DeBach & Warner 1969).

Habrolepis diaspidi (Risbec 1951) (*Anabrolepis*). This species was imported (as *Habrolepis aspidioti*) from Eritrea in 1953 in a biocontrol program against *Diaspidiotus perniciosus* (Compere & Annecke 1961). Although it propagated on this host in the lab, it failed to establish when released in southern California (Rosen & DeBach 1978).

Habrolepis oppugnati Silvestri 1915. This species was imported from Eritrea and released in 1953 in Riverside and San Diego counties against *Diaspidiotus perniciosus* (Clausen 1955) but there is no record it established.

Hambletonia pseudococcina Compere 1936b. Peck (1963) reported this species was introduced and recovered in California, citing Clausen (1956a), but the latter reference reported that this species had been imported into Florida, not California.

Leptomastix epona (Walker 1844) (*Encyrtus*). This is a Palearctic species that has been cultured for biocontrol programs. Stock from England was used to begin a colony in Chile, and material from that colony was released in the late 1990s in San Luis Obispo and Santa Barbara counties in a biocontrol program against *Pseudococcus viburni*, but it failed to establish (Daane et. al. 2008).

Leptomastix flava Mercet 1921. This species was imported from Israel in the 1970s in a biocontrol program against *Pseudococcus comstocki*, and was released in Tulare county (Meyerdirk & Newell 1979), but it was not recovered subsequently (Meyerdirk et al. 1981).

Metaphycus alami Tachikawa 1968. This is a Palearctic species originally described as *M. eriococci* Alam, 1957. Tachikawa (1968) recognized this name was a junior homonym of *M. eriococci* (Timberlake 1916), and proposed *M. alami* as a replacement name. Unfortunately, probably due to a confusion between *M. eriococci* (Timberlake) and *M. eriococci* Alam, the latter was listed from North America (as *M. alami*) in Noyes (2001).

Metaphycus chermis (Fonscolombe 1832) (*Cynips*). This is a Palearctic species imported into California in 1939 in a biocontrol program against *Parthenolecanium corni* as *M. mayri* (Timberlake 1916), but it failed to establish (Bartlett 1978a).

Metaphycus citrinus Compere 1957. This species was imported from Eritrea in a 1953 biocontrol program against *Saissetia oleae* but failed to establish (Bartlett 1978a). It evidently also showed interest in *Coccus pseudomagnoliarum* in the lab and was released against that species as well, but with no report of success (Bartlett 1978a).

Metaphycus dispar (Mercet 1925). This species was imported into California (as *M. tamakatakaigara* Tachikawa) from Japan for control of *Eulecanium kunoense* (Kuwana) in the 1980s, but apparently failed to establish (Kennett 1988).

Metaphycus flavus (Howard 1881) (*Aphycus*). This is a Holarctic species that was introduced into California several times beginning in 1949 (Compere 1957). In the 1950s it was imported from Morocco and Spain in a biocontrol project against *Saissetia oleae* (Bartlett 1978a). van den Bosch et al. (1955) noted it appeared to be permanently established, but later reports (Bartlett 1978a; Kennett 1986; Daane et al. 1991; Lampson & Morse 1992) found no sign of this species. In 1996, a species initially identified as *M. flavus*, but later referred to as *Metaphycus* sp. nr. *flavus*, was imported from Turkey and released in Riverside and Tulare counties—it was shown to be a useful augmentative agent against *Coccus pseudomagnoliarum*, but there was no evidence that it became established (Bernal et al. 1999; Schweizer et al. 2002).This species may prove to be synonymous with *M. luteolus* (Guerrieri & Noyes 2000).

Metaphycus gilvus Compere 1957. This species was introduced into southern California from Eritrea in 1953 under the name *M. praevidens* (Silvestri) for control of *Saissetia oleae* (van den Bosch et al. 1955), but there is no record that it ever became established (Bartlett 1978a; Daane et al. 1991; Lampson & Morse 1992).

Metaphycus insidiosus (Mercet 1921). This species was imported from France in 1939 and again in 1955, for control of a lecanium scale (Compere & Annecke 1961). This may have been one of the suite of imported agents that Bartlett (1978a: 62) reported released in small numbers in San Jose, none of which established. However, this species

apparently is morphologically indistinguishable from *M. californicus*, so determining its true status in California would probably require molecular analysis.

Metaphycus lichtensiae (Howard [in Howard & Ashmead] 1896) (*Aphycus*). This is an Oriental species, imported from Pakistan in 1957 in a biocontrol program against *Saissetia oleae*, but failed to establish (Bartlett 1978a) (not from South Africa in 1958, as reported in Daane et al. 1991).

Metaphycus maculipennis (Timberlake 1916) (*Aphycus*). This is a widespread species (Noyes 2001), which was introduced into California from Europe in 1939 in a biocontrol program against *Parthenolecanium corni*, but it apparently failed to establish (Bartlett 1978a). I presume that the record of this species from Sacramento, California in Guerrieri & Noyes (2000), refers to insectary material. Specimens collected in France (UCRC) were reared from *Sphaerolecanium prunastri* (Boyer de Fonscolombe) (**New host record**).

Metaphycus melanostomatus (Timberlake 1916) (*Aphycus*). This is a Palearctic species that was imported into California in 1939 in a biocontrol program against *Parthenolecanium corni*, but it failed to establish (Bartlett 1978a).

Metaphycus orientalis (Compere 1924) (*Aphycus*). This is an Oriental species imported into California in the early 1950s, and again in 1985, in a biocontrol program against *Coccus pseudomagnoliarum*, but it never established (Bartlett 1978a; Kennett 1988).

Microterys lunatus (Dalman 1820) (*Encyrtus*). This is a Palearctic species imported into California 1939 in a biocontrol program against *Parthenolecanium corni*, but it failed to establish (Bartlett 1978a).

Microterys okitsuensis Compere 1926b. This species was imported from China and Japan in a series of biocontrol programs against *Coccus pseudomagnoliarum* and *Saissetia oleae* from 1922 through the 1980s, but it failed to establish (Bartlett 1978a; Kennett 1988).

Microterys tricoloricornis (De Stefani 1886) (*Encyrtus*). This species was imported from Mexico in a biocontrol program against *Saissetia oleae* as *M. consobrinus* (Mercet 1921), but it failed to establish (Bartlett 1978a).

Ooencyrtus johnsoni (Howard 1898). This species was described from Texas, and has since been reported along the eastern seaboard of the USA (Noyes 2001). In California, it was initially reported from Orange County (Essig 1922) and later from Imperial County (Clancy 1946b) and Riverside and Santa Barbara counties (Vol & Goeden 1973). Maple (1937) considered specimens he collected from Orange County as "undoubtedly the same as described by Howard and recalled by Essig." However, the original description reported that the species had "all legs uniformly honey-yellow". I have not seen the holotype, but I have examined the allotype, and its legs are indeed completely yellow, while southern California specimens collected by E.O. Essig and identified as *O. johnsoni* (EMEC) have the femora darkened, as does the specimen appearing in Figure 1 in Maple (1937). Further, the sculpture of the head of the allotype appears more finely reticulate than any of the other California specimens previously identified as *O. johnsoni*. Therefore, in the absence of a definitive revision of Nearctic *Ooencyrtus* species, I consider that *O. johnsoni* is restricted to the east of the Rocky Mountains, and California records of that species are more properly ascribed to an undescribed morphospecies.

Psyllaephagus trioziphagus (Howard 1885) (*Encyrtus*). This is a widespread species in the New World, ranging from Canada to Brazil, but (in the USA) with no confirmed records west of Texas (Noyes 1996). Gordh (1979) listed this species from California, but I have been unable to find any specimens or published papers confirming this distribution. Cazier (1964) reported this species from Arizona as a parasitoid of *Kuwayama medicaginis*, but I have inspected voucher specimens, and in my opinion they are not conspecific with *P. trioziphagus*.

Trichomasthus cyanifrons (Dalman 1820) (*Encyrtus*). This species was supposedly introduced from Europe into southern California in 1939 and 1948–1950 in a biocontrol program against *Eriococcus spurius*. After the second attempt it reproduced for one generation in the field, but then died out (Flanders 1952). Additional releases (again with a species identified as *T. cyanifrons*) were made from 1952–54 in northern and Central California—this effort resulted in establishment, but Dreistadt & Hagen (1994) reported the species was actually *T. coeruleus*.

Tropidophryne melvillei Compere 1939a. This species was imported from Kenya in 1948, apparently in the hopes of using it against "*Pseudococcus* species" (Smith & Flanders 1949). Known to attack *Planococcus citri*, this species was released in a biocontrol program against that pest, but it failed to establish (Bartlett & Lloyd 1958). It was also released at or about the same time against *Pseudococcus maritimus* (Bartlett 1978b), although it was not clear if that species was an acceptable host. The parasitoid was recovered afterwards (Bartlett 1978b), but I could find no record of it becoming permanently established.