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## Terrestrial Arthropods of Edwards Air Force Base, 1996-1998

Gordon Pratt

November 2000

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November 2000

# **Terrestrial Arthropods of Edwards Air Force Base, 1996-1998**

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**Final report**

Approved for public release; distribution is unlimited

Prepared for Edwards Air Force Base, Edwards, CA 93523  
Monitored by Environmental Laboratory  
U.S. Army Engineer Research and Development Center  
3909 Halls Ferry Road, Vicksburg, MS 39180-6199

# Contents

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Preface . . . . .	iv
1—Introduction . . . . .	1
Background . . . . .	1
Purpose and Scope . . . . .	4
2—Study Area and Methods . . . . .	5
Study Area . . . . .	5
Methods . . . . .	9
3—Results . . . . .	11
Background . . . . .	11
Distribution . . . . .	13
Toxic and Noxious Invertebrates . . . . .	17
4—Discussion . . . . .	18
Noninsect Arthropods . . . . .	18
Apterygota . . . . .	19
Pterygota – Ephemeroptera and Odonata . . . . .	20
Orthoptera . . . . .	20
Dictyoptera . . . . .	21
Isoptera and Dermaptera . . . . .	22
Psocoptera and Thysanoptera . . . . .	22
Homoptera . . . . .	22
Hemiptera . . . . .	23
Neuroptera . . . . .	23
Coleoptera . . . . .	24
Trichoptera . . . . .	25
Lepidoptera . . . . .	25
Diptera . . . . .	27
Hymenoptera . . . . .	28
New, Rare, and Unique Species . . . . .	30
References . . . . .	31
Appendix A: Species Collected . . . . .	A1

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# Preface

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This report describes a series of flood and fauna surveys conducted for Edwards Air Force Base, Edwards, CA. These surveys checked for federally listed endangered or threatened species and obtained information for an overall resource management plan. Previously, surveys have been conducted for tortoises, butterflies, birds, and eubranchipods (including tadpole, clam, and fairy shrimp). This report details the final results of a survey for terrestrial macroarthropods conducted during 1996 through 1998 by Dr. Gordon Pratt, University of California at Riverside, under contract DACA39-39-96-0028. This report presents results of the 3-year study.

This work was monitored by members of the staff of the U.S. Army Engineer Research and Development Center (ERDC), Environmental Laboratory (EL), Vicksburg, MS.

During the conduct of this study, Dr. John Keeley was Director, EL, Dr. C. J. Kirby was Chief, Environmental Resources Division, and Dr. Al Cofrancesco was Chief, Aquatic Habitat Group.

At the time of publication of this report, Dr. James R. Houston was Director of ERDC, and COL James S. Weller, EN, was Commander.

This report should be cited as follows:

Pratt, G. (2000). "Terrestrial Arthropods of Edwards Air Force Base, 1996-1998," Technical Report ERDC/EL TR-00-20, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

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# 1 Introduction

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## Background

Edwards Air Force Base (EAFB) is located in the Mojave Desert in Southern California, north of the city of Los Angeles. This large military base spans parts of southeastern Kern, northern Los Angeles, and western San Bernardino Counties. Although the base covers approximately 2,589 sq km (1,000 sq miles), there is only about 305 m (1,000 ft) in topographic relief from the lake bottom around 610 m (2,000 ft) to the highest ridgeline at just above a 914-m (3,000-ft) elevation. Terrain of potential value for terrestrial arthropods and other organisms consists of sand dunes, dry open hills, valleys, dry lakes or playas, smaller claypans, and permanent pools. Vegetation around the playas, the pools, and claypans are salt-bush scrub, joshua tree woodlands, cottonwood and willow thickets, and mesquite bosque. Playas and most pools are devoid of macrophytes (Branchipod Research Group 1993). The uplands are largely composed of creosote bush scrub.

A series of floral and fauna surveys have been conducted by EAFB personnel. This is being done to check for federally listed, endangered, or threatened species and to obtain information for a complete resource management plan. Previous surveys have been conducted on tortoises, butterflies, birds, and eubranchipods (including tadpole, clam, and fairy shrimp). Surveys are in progress to obtain information on endangered or threatened species, as well as common species, to provide data for the proposed habitat management plan.

Southern California is unusually rich in biological diversity and endemism (species with restricted distributions), particularly as compared to other regions of North America. Partly because of this high diversity and endemism, this area of California has been identified as one of 18 global "hot spots" of conservation concern (Wilson 1992). Although arthropods comprise the largest fraction of this diversity, the actual number of species can only be approximated because of the near absence of comprehensive surveys of this group. Hogue (1974) estimated 3,000 to 4,000 insect species for the Los Angeles Basin; however, this number probably far underestimates the actual number. In any case, all of Southern California probably

has many times that number. Meanwhile, as a result of the rapid conversion of natural habitats for human uses, most of the region's unique natural communities are being rapidly extirpated even before their invertebrate components have been determined. This is particularly true of areas surrounding EAFB and of some concern, since in the near future, the base may have the only remaining undeveloped land in the region.

Intensive surveys of arthropod diversity are known from only two sites in southern California (Ballmer 1995). One site, the El Segundo Dunes, near Los Angeles International Airport was the subject of intensive (but incomplete) biological surveys during the late 1930s (Pierce and Pool 1938) and again during the late 1980s (Mattoni 1990). The University of California's Deep Canyon Desert Reserve near Palm Desert has been surveyed by a succession of University researchers, students, and visiting scientists over the past 34 years. So far, this survey has yielded about 5,000 invertebrate species, 2,600 of which have been classified (Frommer 1988).

There have been already many species lost from the El Segundo Dunes. During the 50-year period between the surveys of the 1930s and 1980s, 36 of the 91 plant species and 66 of 825 invertebrate species have been extirpated from the dunes. Since the original invertebrate survey was far from complete, the invertebrate number lost may be far greater. In addition, during that period, 171 nonnative plants and 20 invertebrate species have become established on the dunes.

The introductions of plants and animals have had an effect upon the interaction of species throughout the dunes. For instance, the introduction of *Eriogonum fasciculatum* could have caused the eventual extirpation of the endangered El Segundo Blue at the dunes (Pratt 1987; Longcore et al. in preparation). The larvae of this butterfly feed specifically on flowers and seeds of *Eriogonum parvifolium*. There are other insects that also use the same plant resource, but unlike the El Segundo Blue, these other insects are not adapted specifically to the bloom period of the buckwheat. Therefore, when *E. fasciculatum* was introduced to the dunes, they were able to switch to its earlier bloom period.

Therefore, when the *Eriogonum parvifolium* came into bloom a month after the *E. fasciculatum*, these insects switched back to their natural food plant. Therefore, after the introduction of *E. fasciculatum*, there was an increase in insects that fed upon the flowers and seeds of the *E. parvifolium*. These other insect herbivores became more effective competitors with the El Segundo Blue and seed production of the *Eriogonum parvifolium*, the specific food for the El Segundo Blue, was drastically reduced.

Based on correlations of plant with invertebrate species richness, Ballmer (1995) estimates there are as many as 10 invertebrates for every plant species. Of these invertebrates, over 95 percent are arthropods, and of the arthropods, 95 percent are insects. Previous plant surveys have found as

many as 330 plant species at EAFB (Charlton 1995). Therefore, from these surveys it is estimated there can be as many as 3,000 arthropods at EAFB.

Desert arthropods of the western Mojave are highly seasonal and dependent on rain during the winter and spring months. In this desert, everything depends on water and its availability. Many of the leaf litter species, such as Jerusalem and Camel Crickets, Diplurans, Jumping Bristle-tails, Centipedes, and Millipedes, only occur at the soil surface during moist months that usually occur between the months of November to March or April and sometimes into May. During the rest of the year, they are buried deep within the soil.

Other arthropods, such as butterflies, moths, leaf-feeding beetles, and herbivorous flies, follow the availability of their specific food plants and occur only when they are flowering or leafing out. Many bees, wasps, beetles, and flies seem to seasonally follow particular nectar sources. Even though the desert may appear extremely dry during the hottest season of the year, it comes alive with arthropods at night, such as large Tenebrionid and Scarab beetles, moths, wasps, ants, spiders, scorpions, and solfugids. This adaptive behavior is as a response to the diurnal conditions caused by drying effects of the hot desert sun. Because of the great morphological variation in arthropods, particularly the insects, they are well adapted to the desert's severe and often unpredictably changing environments.

The list of arthropods at EAFB is not complete. Special efforts were made on collecting the larger arthropods, since they were the easiest to identify and have been well-studied by Entomologists. New 'unique' species within this group are most easily identified. There are many species of tiny flies, tiny wasps, and microlepidoptera that were not specifically collected by this survey due to their difficulty in identification. Special nets are needed to collect some of these insects. Most of these wasps and microlepidoptera may not have been named, so at most they are only identifiable to the level of genus.

No specific efforts were made to collect the specialty insects. These insects include the gall making or mushroom and fruit feeding insects that have guilds of organisms that live together, as primary consumers, parasites, and predators. As an example, there are numerous insects that live and feed with the seeds and fruits of Joshua trees. Techniques such as pan and malaise traps, which would have provided many additional species, were not used. Pan traps, which use ethylene glycol, can be toxic to the vertebrate fauna. Malaise traps would not stand up to the strong winds that are common in the Mojave Desert.

During the 1997 season, over 300 species, and during the 1998 season, over 100 new species, were added to the list. It is expected that with each additional year and new sites sampled at EAFB, new species will be found. Many of them will not be encountered for a variety of reasons, such as small size and rarity. Each season provides different climatic advantages and disadvantages for each species. Some arthropods prefer cool, wet



springs and will be most apparent during those years. Other species that prefer wet summers will consequently be most common during those years. Even others may prefer dry seasons, since their resources are highest under those conditions. As examples, two butterfly species, *Precis coenia* and *Nathalis iole*, were not found through extensive collecting during the years of 1994 through 1997, yet they were observed during the wet El Nino season of 1998. One butterfly, *Libytheana bachmanii*, which depends on high summer rainfall in the neighboring state of Arizona, was only observed during the 1996 season.

Since 1997 was a dry year, the total number of species collected then was lower than expected. Although the 1998 season was more moist than previous years, it was also cooler and had fewer sunny days. Sunny conditions were needed for optimal collecting, therefore fewer collecting trips were made during less than ideal conditions. Also during the wet 1998 year, the best sites, such as Piute ponds and Branch Memorial Park that had high arthropod numbers during previous years, were not surveyed. The winter and spring of 1999 was even dryer than previous years, which was the reason that no surveys were made during that year. Many insects that were observed commonly during previous years were not noted during 1999. There are many problems with arthropod surveys, which are not encountered with more predictable organisms.

## **Purpose and Scope**

The purpose of this work was to conduct a 3-year, four-season survey of terrestrial arthropods in major habitats at Edwards Air Force Base, California. Work was conducted in 1996, 1997, and 1998. This report includes the data from the 3-year survey.

## 2 Study Area and Methods

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### Study Area

Thirty-two sites were chosen to be surveyed to cover as much territory and habitats at EAFB as possible over the 3-year period (Figures 1 and 2). Currently the only region that has not been well-sampled is the high security area of the eastern quarter of the base. As a result of the complexity in arranging escorts for surveys in this region, several areas just outside of the base along the border were surveyed during the 1998 season.

All of the following sites had an approximate central location with a circle of a 0.81 km (1/2-mile) radius drawn around that spot. These sites are:

- 1a - Branch Memorial Park, areas around the pond, and the mesquite and cottonwood woodlands just to the north and west (N34° 49.419' W117° 55.390');
- 1b - The south end of Buckhorn Dry Lake, just 3.2 km (2 miles) west of Branch Memorial Park with a number of sand dunes and some mesquite (this locality contains the rare *Astragalus preussii*) (N34° 49.403' W117° 57.367');
- 1c - An area 3.2 km (2 miles) south of Branch Memorial Park with mesquite woodland (N34° 48.486' W117° 57.123');
- 1d - An area 3.2 km (2 miles) north of Branch Memorial Park (N34° 49.776' W117° 55.620');
- 2a - Red Hill, the hills just to the west and the wash to the north (N34° 52.367' W118° 7.323');
- 2b - The northwest end of Rosamond Dry Lake along the old paved road (N34° 52.406' W118° 5.089');
- 2c - The east end of Rosamond Hills (N34° 53.813' W118° 1.060');
- 2d - A site 3.2 km (2 miles) northwest of Red Hill along Pole Line road (N34° 52.767' W118° 7.968');
- 3a - The west side of Piute Ponds (N34° 47.185' W118° 7.743');
- 3b - The north side of Piute Ponds (N34° 47.499' W118° 7.488');

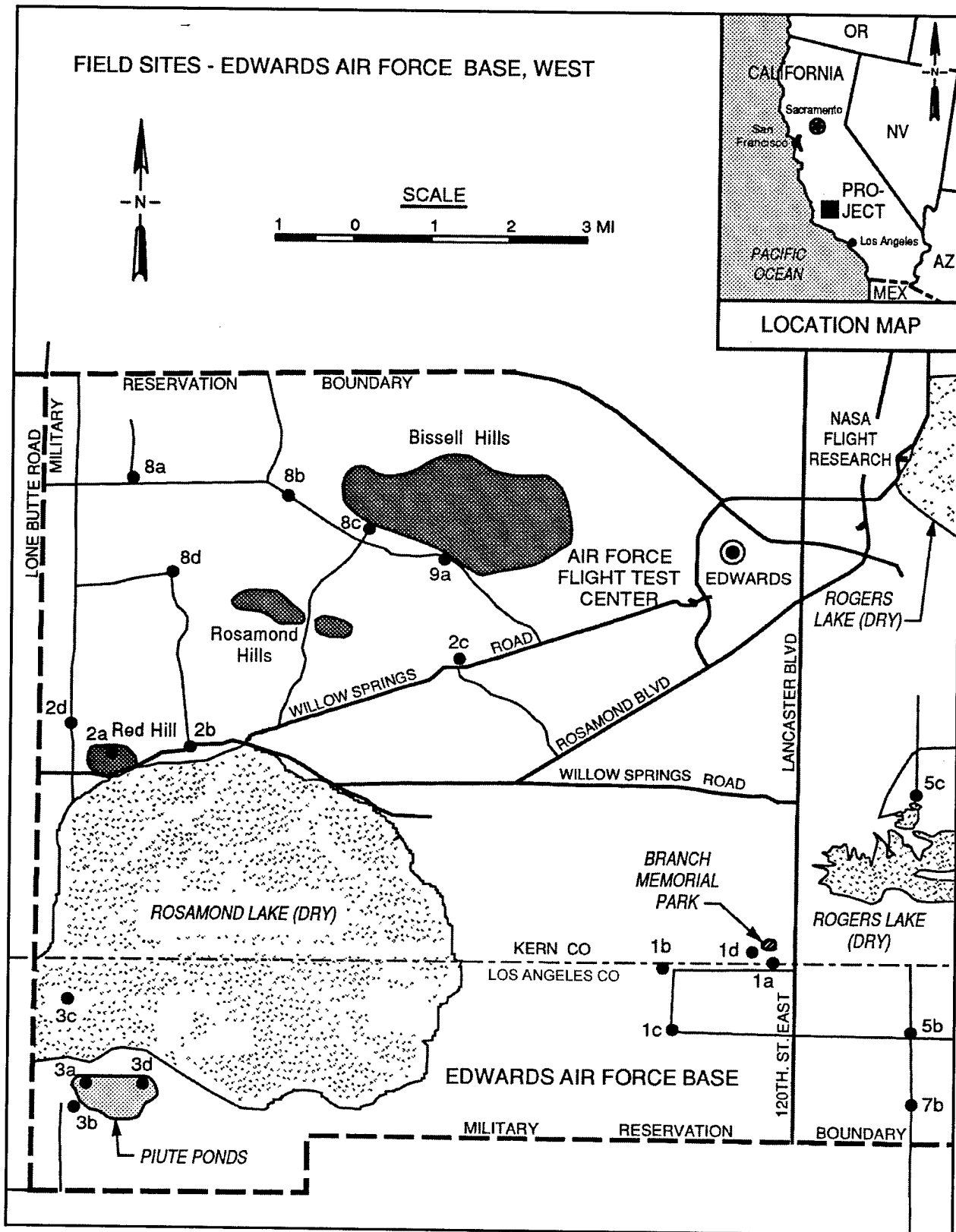


Figure 1. Sites on Edwards Air Force Base, West

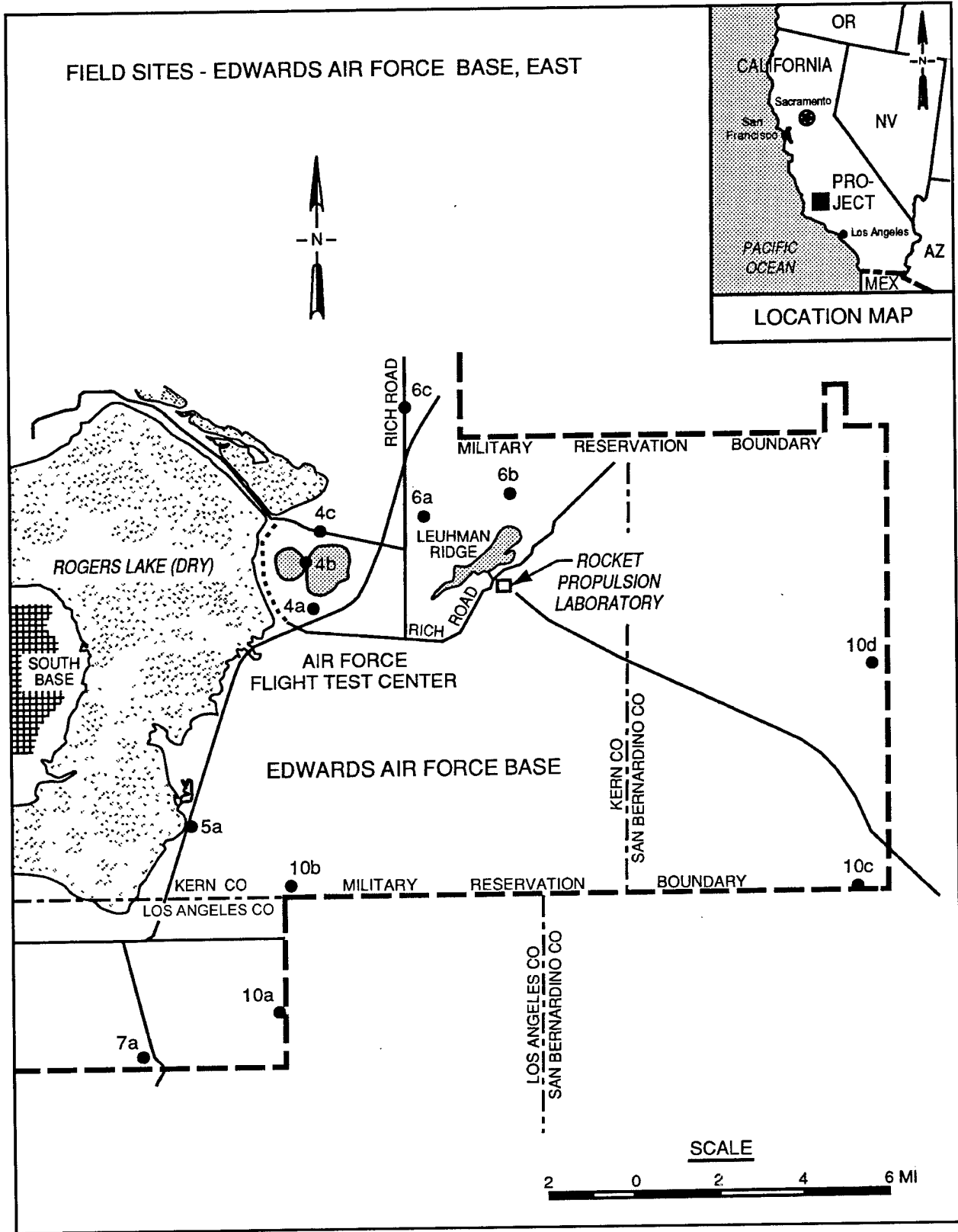


Figure 2. Sites on Edwards Air Force Base, East

- 3c - An area 2.4 km (1.5 miles) north northwest of Piute Ponds (N34° 48.708' W118° 7.848');
- 3d - The east side of Piute Ponds (N34° 47.515' W118° 6.504');
- 4a - A site approximately 1.6 km (1 mile) north of Mercury Blvd and 1.6 km (1 mile) east of Rogers Dry Lake (N34° 55.371' W117° 45.915');
- 4b - A site located near 4a on the peaks of the northeast side of Rogers Dry Lake (N34° 56.299' W117° 46.089');
- 4c - A site located 2.4 km (1.5 miles) northeast of the peaks (N34° 57.023' W117° 45.677');
- 5a - This area includes the sand dunes 4.0 km (2.5 miles) north of Avenue B on the west side of Mercury Blvd (N34° 50.748' W117° 48.976');
- 5b - This areas includes the mesquite woodland just north of Avenue B just west of the intersection with 140th street (34° 48.457' W117° 52,879');
- 5c - This site is along the west side of the sewage ponds on the west side of Rogers Dry Lake (N34° 51.917' W117° 52.876');
- 6a - This is an area 1.6 km (1 mile) north of Leuhman Ridge (N34° 57.217' W117° 43.089');
- 6b - This is along a hill on the northeast side of Leuhman Ridge (N34° 57.695' W117° 43.932');
- 6c - This is an area of saltbush scrub 8 km (5 miles) north of Leuhman Ridge (N34° 59.507' W117° 43.612');
- 7a - This is just off of base along the fence line directly south of Rogers Dry Lake (end of 165th street) (N34° 45.834' W117° 50.213');
- 7b - This area is a mesquite woodland, in an area on the west side of 140th street and south of B street (N34° 47.413' W117° 52.844');
- 8a - This is an area on the northwest corner of EAFB along Sopp Road 1.6 km (1 mile) east of Pole Line Road (N34° 56.365' W118° 6.834');
- 8b - This area is 6.0 km (3.7 miles) east of Pole Line Road along Sopp Road (N34° 56.179' W118° 4.135');
- 8c - This site is 8 km (5 miles) east of Pole Line Road along Sopp Road (N34° 55.720' W118° 2.762');
- 9a - This site includes the western side of Bissell Hills (N34° 55.309' W118° 1.239');
- 9b - This includes the western end of the Rosamond Hills (N34° 55.638' W118° 6.168');
- 10a - This site is at 200th Street south of C Street (N34° 46.777' W117° 46.449');
- 10b - This site is at 200th Street north of C Street (N34° 49.395' W117° 46.468');

- 10c - This site is at the northeast side Red Buttes (N34° 49.123' W117° 31.831'); and,
- 10d - This site includes the western end of the Kramer Hills (N34° 54.113' W117° 31.541').

## Methods

Experts have examined many of the species in the orders Coleoptera, Hymenoptera, Diptera, Lepidoptera, and Neuroptera; representative species from EAFB in these groups have been more accurately identified than they were in previous reports (Pratt 1998, 2000). In this report many of their names have been corrected. Spiders have also been examined and identified by experts. These new and more accurate determinations have been incorporated into this final report for the survey.

Many of the butterflies were identified by sight, since the author knows this group quite well. The remaining insects were identified to order and then family by the keys of Borror, DeLong, and Triplehorn (1981). The insects within each family were organized as to morphospecies. Matching these specimens to previously identified species and morphospecies of the 1996 and 1997 EAFB Survey Collection was a great aid in the identification of these specimens. Taxonomic keys and the Insect Collection at the Entomology Research Museum were used to identify the remaining species as previously described (Pratt 1998).

Dr. Norm Penny, California Academy of Sciences, identified the Neuroptera (Antlions and Lacewings). Dr. Rosser Garrison, research associate of the Los Angeles County Natural History Museum, identified the Odonata (Dragonflies and Damselflies). Mr. Ron Leushner, research associate of the Los Angeles County Natural History Museum, identified the Macrolepidoptera (other than butterflies). Dr. Jerry Powell, University of California at Berkeley, identified the Microlepidoptera. Dr. Arthur Evans, Los Angeles County Natural History Museum, identified the Scarabaeidae. Dr. Terry Griswold, University of Utah, identified the Megachilidae or Leaf Cutter Bees. Mr. Rob Velton, University of California at Riverside (UCR), identified the Buprestid beetles. Dr. John Pinto, UCR, identified the Meloidae of the Coleoptera. Mr. Dave Williams and Mr. Rick Villegas, research associates of the Entomology Museum at UCR, identified the Diptera families Assilidae and Mydidae. Mr. Rick Vetter, UCR, identified the spiders.

Some of the arthropod identifications in this report are incorrect. Certainly the reliability will depend on the level of expertise of the identifier of that group. The Lepidoptera, Neuroptera, and much of the Coleoptera, for this reason, are probably the most reliable. The author identified the grasshoppers, the genera of flies, and the ants through the use of various keys (Strohecker, Middlekauff, and Rentz 1968; McAlpine et al. 1981; Wheeler and Wheeler 1973). Those groups that the author identified

without the use of keys and was least comfortable with will be somewhat questionable as to their reliability. The advantage of identifying species to names, rather than to just morphospecies, although they may be incorrect, is that their identification gives some information on the characters of the specimens as to size, color, and general morphology.

One source of error in identifying arthropods just to morphospecies is that many species are dimorphic, in that the sexes can be quite different from one another. Without examining a collection, one may separate these sexes into different species, without realizing it. In fact, these sexes sometimes differ so greatly that Entomologists in the past have placed them not only in different species, but also in different genera. Some species of ants and termites have individuals in the same colony that perform different functions, such as soldiers and workers. They can be morphologically quite distinct as well. By studying these different levels of variability, these errors in identification can be reduced and possibly eliminated. The most important factor for this study is whether or not the identification is consistent to morphospecies from one specimen to the next, rather than whether or not the identification is correct down to the species level. In case there is future controversy, most of the specimens will be maintained at the Entomology Research Museum at UCR for future research.

## 3 Results

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### Background

There were over 1,000, 800, and 400 arthropod species collected at EAFB during the 1996, 1997, and 1998 field seasons, respectively. Some of the species of the 1996 and 1997 seasons were incorrectly identified and authorities of the specific groups have since improved these identifications. Therefore, those identifications that have changed in this document should be accepted over those of previous reports. From the 3-year survey on the base, there is a grand total of 1,536 species (Table 1). This total slightly exceeds 50 percent of the expected number of 3,000.

Of the 404 species collected in 1998, over 25 percent (107) were new to this survey (Table 1). As in the 1999 survey, over 75 percent of these invertebrates belonged to the four major orders: Coleoptera, Lepidoptera, Diptera, and Hymenoptera, whereas over 93 percent were of the eight major orders which included in addition Orthoptera, Homoptera, Hemiptera, and Neuroptera. There were only slight differences between the 1996, 1997, and 1998 percent totals of the arthropod groups. These changes can be explained in part by changes in focus. For instance, since an expert in Macrolepidoptera was acquired for this study, there was an increase in the collecting of nocturnal Lepidoptera. This explains the highest number of new species (90) being Lepidoptera for 1997. The Lepidoptera were the second highest for new species in 1998. The highest was Hymenoptera (31), and the next highest were Diptera (19) and Coleoptera (15).

The number of spiders nearly doubled during the 1997 over the 1996 season. Of the 13 total spiders collected in 1998, seven species were new. This increase was the result of an increased search for spiders, since it was a group that the author could identify with the aid of an expert.



**Table 1**  
**Numbers of Invertebrate Species on Edwards Air Force Base,**  
**1995-1998**

	1998 Total	New Species	New Percent Total	Grand Total	Percent Total
Spiders	14	7	0.5	45	2.9
Scorpions	3	1	0.1	3	0.2
Solpugids	2	1	0.1	2	0.1
Harvestman	1	1	0.1	1	0.1
Ticks	0	0		1	0.1
Mites	1	1	0.1	1	0.1
Isopods	0	0		1	0.1
Centipedes	0	0		1	0.1
Millipedes	1	0		2	0.1
Diplura	0	0		1	0.1
Thysanura	2	0		3	0.2
Ephemeroptera	0	0		2	0.1
Odonata	1	0		11	0.7
Orthoptera	17	0		39	2.5
Dictyoptera	2	0		6	0.4
Isoptera	0	0		1	0.1
Dermaptera	0	0		1	0.1
Psocoptera	0	0		1	0.1
Homoptera	9	0		52	3.4
Hemiptera	37	9	0.6	92	6.0
Thysanoptera	0	0		2	0.1
Neuroptera	8	1	0.1	23	1.5
Coleoptera	71	15	1.0	243	15.8
Trichoptera	1	0		4	0.3
Lepidoptera	64	21	1.4	265	17.3
Diptera	68	19	1.2	308	20.1
Hymenoptera	102	31	2.0	425	27.7
	<b>404</b>	<b>107</b>	<b>7.0</b>	<b>1,536</b>	

Coleoptera, Lepidoptera, Diptera, and Hymenoptera = 80.8%.  
 Orthoptera, Homoptera, Hemiptera, Neuroptera, Coleoptera, Lepidoptera, Diptera, and Hymenoptera = 94.2%.

## Distribution

All sites visited during 1996 through 1998 were not comparable, since different factors seem to affect total number of species present. For example, of these 32 sites from the 1996 through 1998 survey, only 2 sites, 1a and 3b, had more than 300 total invertebrate species collected, 528 and 397, respectively (Table 2 and Appendix A). Both of these sites had permanent water present, were surveyed for more than 10 visits, and were surveyed for nocturnal invertebrates using a mercury vapor light. The next highest groups were from sites 2c, 5a, 6a, 8a, and 9a (165 to 300 species). Each of these sites was surveyed six or more times and for nocturnal invertebrates. The lowest group, with some overlap, included sites that were surveyed only for diurnal insects for one or two visits during the 1998 season (5 to 63 species).

Water plays an important factor in the number of species present. Sites 1a and 3b, with permanent water present, had a species richness nearly double that of most other sites. Site 5c was an exception, although it had permanent water, yet only 103 species were found. Plants adapted to these water bodies probably play a very large role in supporting high species richness. There were no willows, cottonwoods, or other mesic adapted plants at site 5c or the sewage ponds on the southwest side of Rogers Dry Lake; this was likely responsible for the comparatively few number of species. Two other factors play an important role in number of species present: (a) presence of mesquite woodland, and (b) sand dunes. During the surveys, it was noted that species richness was very high in Mesquite woodland, and there were many unique species in the sand dunes (Andrews, Hardy, and Giuliani 1979). These sand dune systems are acting like series of islands in an ocean of desert.

There are at least two basic criteria that are important in determining the quality of an area and its value for preservation. One is the total number of species and the other is the number of endangered organisms at the site. Certainly determining the total number of invertebrate species in an area is not as difficult as determining the number of those that are endangered. California desert invertebrates are poorly known, and EAFB is no exception. For this reason, endangered invertebrates not recognized on a State or Federal list may not be easily identified, and those collected may even lack descriptions or names. One biogeographic characteristic shared among most California endangered invertebrates is that they exhibit restricted localized ranges. In other words, they are endemic to very small areas. The next best thing, therefore, would be to identify species that exhibit restricted ranges or only occur at one or two very similar localities at the base. This will give some indication as to the uniqueness of the habitat or site in question.

The species that exhibit restricted ranges (here called unique species) on EAFB, i.e., species only found at one locality (Table 2, Appendix A), fall into two categories. One type will be species with actual restricted

**Table 2**  
**Unique and Total Species Per Locality, Edwards Air Force Base,**  
**1995-1998**

Site	No. Visits	No. Unique Species	No. Total Species	No. Unique Species Per Visit	No. Total Species Per Visit	Unique Percent of Total
*1a (Branch Memorial Park)	11	113	528	10.3	*48	21.4
1b (S. Buckhorn Dry Lake)	10	6	98	0.6	9.8	6.1
1c (2 mi S Branch Memorial Park)	7	13	68	1.9	9.7	19.1
1d (2 mi N Branch Memorial Park)	2	5	32	2.5	16	15.6
2a (Red Hill)	6	13	130	2.2	21.7	10.0
2b (NW end of Rosamond Dry Lake)	4	9	71	2.3	17.8	12.7
*2c (E Rosamond Hills)	7	55	227	7.9	*32.4	24.2
2d (W Red Hill)	4	1	27	0.3	6.8	3.7
3a (W Piute Ponds)	7	31	193	4.4	27.6	16.1
*3b (N Piute Ponds)	11	99	397	9.0	*36.1	24.9
3c (1.5 mi NW Piute Ponds)	7	11	86	1.6	12.3	12.7
3d (E Piute Ponds)	5	6	26	1.2	5.2	23.1
*4a (1 mi N Mercury Blvd. & 1 mi E Rogers D Lake)	4	30	185	7.5	*46.2	16.2
4b (peaks on the NE Rogers D Lake)	4	14	73	3.5	18.3	19.2
*4c (1.5 mi NE of the peaks)	4	10	104	2.5	*26	9.6
*5a (sand dunes 2.5 mi N Ave. B on W side Mercury Blvd.)	9	33	204	3.7	*22.7	16.2
5b (mesquite woodland N of Ave. B and just W intersection of 140th St.)	8	19	137	2.4	17.1	13.9

\* The localities where night collecting was done by mercury vapor light.  
<sup>1</sup> Mean unique and total species.  
<sup>2</sup> Mean unique and total species found at mercury vapor light sites.

(Continued)

**Table 2 (Concluded)**

Site	No. Visits	No. Unique Species	No. Total Species	No. Unique Species Per Visit	No. Total Species Per Visit	Unique Percent of Total
5c (W side of sewage ponds on W Rogers D Lake)	7	13	103	1.9	14.7	12.6
*6a (NW Leuhman Ridge)	8	57	300	7.1	*37.5	19.0
6b (NE Leuhman Ridge)	5	10	55	2.0	11.0	18.1
6c (3 mi N of Leuhman Ridge)	1	0	5	0	5.0	0
*7a (N 165th St.)	5	23	165	4.6	*33.0	13.9
7b (W 140th St.)	4	11	91	2.8	22.8	12.1
*8a (1 mi E intersection of Sopp Rd. and Pole Line Rd.)	6	25	170	4.2	*28.3	14.7
*8b	4	27	121	6.8	*30.3	22.3
8c	5	1	42	0.3	8.4	2.4
*9a (W Bissell Hills)	6	31	226	5.2	*37.7	13.7
9b (W Rosamond Hills)	1	0	16	0	16.0	0
10a (200th St. S of Ave. C)	1	1	13	1.0	13.0	0
10b (200th St. N of Ave. C)	1	1	17	1.0	17.0	5.9
10c (Red Buttes)	1	4	31	4.0	31.0	12.9
*10d (Kramer Hills)	2	4	63	2.0	*31.5	6.3
<b>Total</b>	<b>90</b>	<b>169</b>	<b>1,316</b>	<b>1.9<sup>1</sup></b>	<b>14.6<sup>1</sup></b>	
<b>Total</b>	<b>*77</b>	<b>*507</b>	<b>*2,690</b>	<b>*6.6<sup>2</sup></b>	<b>*34.9<sup>2</sup></b>	

ranges and the other will be rare species with wide ranges that were not encountered at the other localities simply because they were rare. The first type are true endemics, while the second type are identified as unique to the locality simply due to sampling bias. Since such rare species exhibit wide ranges, their frequencies should be relatively constant from one locality to the next. Therefore, the number of endemics should be the total number of unique species at a locality minus a relatively constant frequency of rare species. Unfortunately, we do not know the constant frequency of rare species, so the next best thing will be the number of unique species to a locality. With increased surveys over time, rare species should be encountered at multiple localities and eventually the number of unique species will be equal to the true endemics or the species with restricted ranges on base.

Unfortunately, some of the endemics with restricted ranges on base will be overlooked by this method. One reason is that no sampling method actually collects all species. There are many nocturnal invertebrates that are not attracted to lights, there are many species with very short adult life spans, many which are too small for accurate identification, and there are many that are small and wingless. On the other hand, there are species that will be collected and not determined to be endemics or unique species, since they occur in more than one locality. The Tiger Beetles provide a good example. They are probably best thought of as endemics since they are adapted to the salt flats around Piute Ponds. For this reason, these beetles were collected at sites 3a, 3b, and 3d. Another less dramatic example with a restricted range on base is *Apodemia palmeri*. This butterfly feeds specifically on *Prosopis glandulosa* and has a restricted range on base, but the plant is found at sites 1a, 1c, 5b, and 7b, which are all relatively close to one another. Since this species has been found at sites 1a, 1c, and 5b, it is by the selection method not considered an endemic.

As expected, the percentages of unique species represented in the 1998 total collection for most localities was less than those taken in 1997, since over time, rare species should be encountered at more sites as the number of visits increases. Of the 24 sites surveyed during 1996-1997, 16 had lower percent totals and 7 had higher totals in 1998 (Table 2, Appendix A). These decreases in percent totals were not as great as the decreases in 1997, so the percent totals appear to be becoming stable. Most of those that were higher, only sites 1d, 3d, 6a, and 6b, had an increase of greater than 1 percent in 1998. In spite of the drop of unique species in percent of the total for most sites, their order in magnitude remained similar from 1 year to the next. For the five sites (which were surveyed by mercury vapor light), site 3b (north Piute Ponds) exhibited the largest percent unique species, site 2c was next, site 1a next, site 4a next, and site 5a last. Of these five sites, only site 5a fell below 20 percent and within the range of the other sites that were not surveyed at night.

The number of unique species per visit was determined for all sites surveyed at EAFB (Table 2). This number is an estimate of how many new species would be found if additional visits were made to the site. This

information would be particularly useful if this survey was continued for additional years. It is not an estimate that is relative to the other sites, since some sites that were visited only once or twice will have a far greater percentage of the total unique species to be added at that site. Therefore, with increased numbers of visits there should be fewer unique species at the site.

## Toxic and Noxious Invertebrates

Toxic and Noxious Invertebrates were discussed in the report of the 1996 survey (Pratt 1998). There are two spiders, at least two scorpions, a number of wasps, a number of biting flies, and probably at least one true bug. The two spiders are the Black Widow (*Latrodectus hesperus*) and the Desert Recluse (*Loxosceles deserta*). These two species can be avoided by wearing gloves when turning trash, rocks, logs, etc. Since the scorpions are nocturnal, they can be avoided by wearing shoes at night and wearing gloves when turning over objects on the ground where they could be hiding. Most of the scorpions have only a mild sting and are not highly poisonous. The bug, which would be a *Triatoma* species, called a Kissing Bug (because it seems to prefer to bite people on their lips) is a nocturnal blood-sucking insect that largely feeds on Pack Rats (*Neotoma* sp.). This bug is common in the military bases of Fort Irwin and China Lake. The flies belong to the families Horseflies (Tabanidae), No Seeums (Ceratopoginidae), Mosquitoes (Culicidae), and Blackflies (Simulidae). Most of these can be avoided by keeping clear of permanent water sources such as Piute Ponds and Branch Memorial Park. A number of the bees and wasps that occur on base can sting under certain conditions. They can be avoided by staying clear of flowering bushes. The dog tick, *Dermacentor variabilis*, is at least present at EAFB. It is possible that other species may be present.

## 4 Discussion

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A total of 404 invertebrate species, 107 considered to be unique, were collected in 1998 from the EAFB (Table 1). Eighty percent of the total species belonged to four large orders: Coleoptera, Lepidoptera, Diptera, and Hymenoptera. Most of the remaining species were true bugs and spiders.

The last survey year (1998) that fieldwork was done on this survey in EAFB was during an El Niño climate. Because of the high rainfall, one would have expected a higher number of species to be collected compared to previous years. Part of the reason that there were not more arthropods collected during 1998 is that the sites with the highest species richness during 1996 and 1997 were not included. Unfortunately, the purpose of this survey was to cover as much of the base as possible, not comparing sites from one year to the next. For this reason, some areas were not surveyed during the El Niño year. Some of the sites that were surveyed during 1998 may have had higher relative species richness when compared to previous years, simply because of the higher rainfall.

### Noninsect Arthropods

Arthropods are organisms that have an external skeleton or exoskeleton. All of the species found during this survey are listed in Appendix A. In the deserts over 95 percent of these arthropods are insects. The remaining groups other than insects include crayfish, crabs, spiders, harvestmen, scorpions, ticks, fairy shrimp, tadpole shrimp, clam shrimp, mites, millipedes, centipedes, and isopods (pillbugs and sowbugs). Crayfish and crabs, if present at EAFB, were probably accidentally introduced. The remaining aquatic noninsects, such as fairy, tadpole, and clam shrimp, have been well studied by other EAFB personnel, while the nonaquatic species were covered to a great extent by this survey.

From this survey spiders probably represent the greatest diversity of the noninsect arthropods. Only one or two species of harvestmen (daddy long-legs) are apparent. It is suspected that there are only three or four species of isopods found on the EAFB, and only one or two of these are native. The centipedes and millipedes probably are represented by fewer than a

half a dozen species. Only a few species of scorpions were found during this survey. One of these, the hairy scorpion (*Hadrurus* species) reaches nearly 10 cm (4 in.) in length and may be the largest arthropod found on base. The single species of tick found at EAFB was found on the author of this document. There are probably a few more species found on the various native lizards.

The only group of noninsects, which may be far more diverse than indicated by this survey, is the mites. The only morphospecies found was a large red mite that was observed on the soil surface after fall-winter-spring rains and was collected in the pitfall traps. There are many mite species which are found on plants and in the leaf litter. All are small and difficult to identify. Many were not specifically searched for and if they were found were not identified. This is an extremely difficult group to identify.

The spiders were identified to species when possible. The advantage of working with this group, over the other noninsect arthropods, is that there are experts available that can identify them. Two of the species are considered poisonous, as discussed above. Although Tarantulas were not collected during this survey, they are undoubtedly present since *Tarantula Hawks* (a wasp) that specifically feeds on these spiders were present at the base.

## **Apterygota**

The insects are divided into a number of evolutionary groups. The two most basic groups are the Apterygota and the Pterygota. The Apterygota represent the group of insects that predate the evolution and formation of wings, while the Pterygota are the insects that evolved after the formation of wings. Those species of the Pterygota that lack wings have lost them through time. Therefore, the Apterygota are the most primitive of the insects. Among this group are the orders called the Collembolans (Springtails), Diplurans, and Thysanurans (silverfish and jumping bristletails). Many of these arthropods are highly sensitive to water loss and are only visible during the winter and spring shortly after rain.

The Collembolans or springtails are not a very diverse group in the desert. The one species that was found at the east side of Piute ponds was not found elsewhere on base. There is an additional species of Collembolan that is found in Fort Irwin to the east that comes out after summer rains. This species was common during the summer of 1998.

There is only one species of Dipluran (a Japygid) that was observed during this survey. This species was found in late winter under rocks and logs and can be distinguished from other Diplurans by the sclerotized pincer structures at the posterior end. It is probable that there is one or two species of Campodeidae also on base during the winter months.



The Thysanurans or Silverfish and Jumping Bristletails are another group of Apterygota. This group is also not very diverse. There is one species on EAFB that is specific to dune habitats. There is a Jumping Bristle-tail that is found within the leaf litter. The other silverfish is often found beneath logs and rocks in a variety of habitats.

## **Pterygota (Ephemeroptera and Odonata)**

The most primitive species of the Pterygota are the Mayflies (Ephemeroptera), Dragonflies, and Damselflies (Odonata). Species found in the fossil record indicate that species very similar to present day species of both Odonata and Ephemeroptera have been present for over 200 million years (Wootton 1981). All of these species have nymphs that are aquatic; therefore, they require water to complete their development. But the adults have wings and can travel great distances. The dragonflies are even known to migrate great distances. Only one of the species, *Tramera onusta*, is considered to be rare. The presence of the mayflies at the base is somewhat surprising, since it is very fragile and unlikely to travel great distances. However, one of these mayflies wandered a great distance from a water body.

## **Orthoptera**

This group contains the grasshoppers, crickets, katydids, Jerusalem crickets, camel crickets, and long-horned grasshoppers. Ancestors to this group also have been around for over 200 million years (Wootton 1981).

The more visible a species is, the more likely it has been named and can be identified. Because of their behavior, the grasshoppers are among the best known of the Orthoptera. They are almost as well known as the butterflies and there is a book on the California species (Strohecker, Middlekauff, and Rentz 1968). Some of the species found on EAFB are restricted to sites along the western edge of the base.

One of the grasshoppers is specifically adapted to *Larrea tridentate* (creosote). The green, black, and white pattern makes this species very cryptic when on its food plant. The *Trimerotropis* have a number of species that are common in the desert and are difficult to identify, without close examination. One species, *Ligurotettix coquillettii*, commonly makes clicking noises that one can hear as one hikes through the desert. This species seems to prefer to hide in thorny bushes, such as *Lycium* species, but uses creosote when these thorny bushes are absent.

The only member of the long-horned grasshoppers (Tanaoceridae) found in EAFB is *Tanaocerus koebelii*. There is only one other species found in southern California. *Tanaocerus koebelii* is quite common throughout the Mojave Desert but is most commonly found in late winter along dry rocky slopes before most other insects become visible. The nocturnal crickets and katydids are next well known. The common desert narrow winged katydid, *Arethaea gracilipes*, may be at the western edge of its range in EAFB. *Capnobotes fuliginosus* is large and aggressive for a katydid and has been observed feeding on moths at mercury vapor lights. Identifying singing males in tall desert bushes can help locate this species during midsummer. This species looks even like a large desert locust (grasshopper) except for its long antennae. On warm nights during early summer, the beautiful green, black, yellow, and white shield backed katydid, *Neduba ovata*, can be found by following its singing males in low desert bushes and Joshua trees.

The camel and Jerusalem crickets are probably the least known of the Orthoptera. The reason is that they are not only nocturnal but hide within the sand, soil, or beneath rocks and logs, and are rarely seen. They also have characters that make the species more difficult to distinguish. The camel crickets are perhaps the best understood, since they often have specific leg characteristics, which can distinguish the species. On the other hand, the Jerusalem crickets have poorly defined morphological characters, but exhibit behaviors that are important in species recognition.

## Dictyoptera

This group contains the cockroaches and praying mantises. They have been in the fossil record for near 300 million years (Wootton 1981). There are three species of desert cockroaches found on EAFB. Two of these species (in the genus *Arenivaga*) are restricted to sand dune habitats and at least one of them probably does not even have a name. The females of these species are wingless, so there may be local restricted species found on EAFB. Very little is known of the species, but it is suspected that this group may be very rich in southern California. The *Eremoblatta subdiphana* can be found along the coastal slope as well as in the desert. There may be a couple of more species found on the base, particularly species that are found in urban areas such as *Periplaneta americana*.

There are three praying mantises found in EAFB. Two of these are relatively large, green, and roost above the ground in bushes, while the third species, the ground mantis, *Litaneutra minor*, rarely crawls above the ground.

## Isoptera and Dermaptera

There are probably a few species of termites (Isoptera) found on base. Identification to the species level is based on the soldiers or winged adults. These insects live in colonies and are responsible for the decomposition of wood from dead and dying Joshua trees, mesquite, and other bushes and trees. There are probably a few species in this order at the base, although this is not a species-rich group.

Only one Dermaptera (earwig) was found on base. This *Euborellia* species is not native to North America and is not well-adapted to the desert, which may be part of the explanation why this species was only observed once. None of the earwigs are adapted to or commonly found in the desert.

## Psocoptera and Thysanoptera

These are the booklice (Psocoptera) and thrips (Thysanoptera). The adults of both of these families are quite small. Both orders probably do not have many species. The Thysanoptera are the most likely to have a dozen or more species. Their small size and morphological characters make them a difficult group to work with.

## Homoptera

Homoptera have been divided into two suborders: the Auchenorrhyncha and the Sternorrhyncha. The Auchenorrhyncha have been well-studied during this survey, whereas the Sternorrhyncha have not. The reason for their better study is that the morphological characters of the Auchenorrhyncha can more easily separate the species than many of the Sternorrhyncha. The adult females of many of the Sternorrhyncha, which are the largest and most frequently collected stage, are simply bags of eggs without much in the way of morphological characters to separate the species. Only the Aphididae and Psyllidae, of the Sternorrhyncha, can be easily separated into morphospecies. Their soft bodies make the Aphididae easily damaged and often difficult to identify.

The one member of the Cicadidae found on EAFB, *Okanagana vanduzeei*, is the largest species of Homoptera on base. It is common on creosote bushes. During early to midsummer, the humming sounds made by this cicada carry great distances across the desert. Yet this cicada is very sensitive to approach, and often takes off long before one can get close enough to observe. This species is the food of the large wasp, the cicada killer.

All of the Homoptera are herbivores and feed by piercing-sucking mouthparts. Some of the species feed only on specific plant species. The Cicadellidae are the most species rich of the Auchenorrhyncha. Some of these species, such as from the *Norvellina* genus, probably feed only on one specific plant species. The Flatid, *Ormenis saucia*, is specifically adapted to *Ephedra*, or Mormon Tea. Two of the four treehoppers (Membracidae), *Multareis cornutus* and *Multareoides bifurcates*, are specifically associated with *Larrea tridentata*. Another treehopper, a *Micrutalis* species, is specifically associated with *Croton californica*.

## Hemiptera

The Hemiptera are a complex of species with different feeding behaviors. They all have piercing mouthparts, which they use to suck up their food. Some species are plant specific, while others are predators, and still others such as some of the Pentatomidae exhibit the ability to be both. The Miridae are the most species-rich of the Hemiptera. The genus *Phytocoris* is one of the most species-rich groups of the different Miridae genera. Many of these species are probably plant species specific and some may have restricted ranges.

Of the predator species of Hemiptera, the ones associated with water are the most likely to have restricted ranges. Some of the aquatic species of Hemiptera belong to the Notonectidae and Corixidae. It is surprising that one of the species of the Notonectidae was only recorded from a ridgeline at a mercury vapor light. Other species occur along the edge of bodies of water, such as the Saldidae. Some other predators belonging to the families Phymatidae and Reduviidae feed and hide within flowers. It is interesting that the species of Phymatidae found in EAFB is rare and was found only in neighboring sites on the northwest side of base sites 8c and 9a (sites identified in Chapter 2).

## Neuroptera

The Neuroptera are all predatory and exhibit a complex life history. They have what is called a complete metamorphosis with an egg, larval, pupal, and adult stages. All of the preceding species of insects have had a gradual or incomplete metamorphosis. In the Neuroptera, the larvae all have jaw like piercing-sucking mouthparts, while the adults have simply chewing mouthparts. The green and brown lacewings (Chrysopidae and Hemerobiidae) have hunting larval stages, while many of the Antlions (Myrmeleontidae) have larval stages that occur at the base of a sand pit. At the base of these pits, the larvae will capture and feed upon all of the ants that fall in.

Many of the species of Neuroptera exhibit broad ranges, so that there is probably no species found in EAFB with distributions restricted to one or two sites on base. Some of these species are restricted to sand dunes but, because of their ability to fly, they are not restricted to specific dunes. Many of these species of Neuroptera were collected at night at a mercury vapor light.

## Coleoptera

Coleoptera or beetles are another rather old order since they also are present in the fossil record for over 230 million years (Wootton 1981). Some of the families, such as the Buprestidae, Cerambycidae, Cicindelidae, and Scarabaeidae, are very popular among Coleopterists. The Carabidae, Chrysomelidae, Melyridae, and Tenebrionidae are among the most species-rich families of desert beetles.

Many Carabidae exhibit restricted ranges, so fall into the category of unique species. There are probably many additional species in this group that are found on EAFB. Two of the larger species have a strong repellent odor. Some of the Bruchidae feed specifically on Mesquite seeds. Of the Buprestidae or metallic wood-boring beetles, *Hippomela obliterata* and *Hippomelas fulgida* are among the largest of the beetles on base. The *H. obliterata* were common on creosote during all 3 years of the survey. They often flew away when the creosote bushes were approached.

The Cerambycidae are the long-horned beetles. The larvae of many of the species of this family bore into wood. They are often large in size and some are rather attractive, which is the reason for their popularity. *Derobrachus geminatus* is the largest species. The Chrysomelidae, a species-rich family, is the closest relatives to the Cerambycidae. The larvae of this family feed on leaves, which is why they are called the leaf beetles. *Pachybrachys desertus* is common on Creosote. Both of these beetle families probably have species that would be additions to EAFB.

The tiger beetles or Cicindelidae are one of the most studied beetles of the desert. These beetles are well named since they are highly aggressive and actively hunt their prey. All of the species found in EAFB are associated with moist mud where their larvae can make burrows into the soft soil. Some of the species are associated with restricted habitats. Two of the four species collected on EAFB are major range extensions for the species.

There are several snout beetles (Curculionidae) found on EAFB. Of these species, the genus *Ophyrastes* has a couple of species that are found largely on Creosote (Hurd and Linsley 1975). The Dermestidae are important in the decomposition of dead animals. *Dermestes marmoratus* is the largest species found on EAFB. The Elateridae or click beetles are rather species rich in EAFB. There are probably many more species present than

were found during these surveys. Some of the click beetles are adapted to sand dune habitats and may have restricted distributions.

The aquatic beetles belong to the families Dytiscidae and Hydrophilidae. Over half of the species from EAFB were found around Piute ponds. The largest water beetle was *Hydrophilus triangulus*, which was common and only found around Piute ponds. The Meloidae or Blister beetles are common insects of the desert. *Cysteodemus armatus* is a common species that can be found running quickly over the desert floor like a large spider. *Lytta magister* is the largest Meloid and is colored aposematically with black and orange.

The Ptinidae are called spider beetles, because of their strong resemblance to spiders. The Scarabaeidae is a relatively species-rich family of a relatively large species. There is at least one undescribed species of *Serica* on EAFB. The Tenebrionidae is one family of beetles that is among the best-adapted family to desert environments. It is certainly one of the most species-rich families of the desert. The stinkbug (*Eleodes armata*) is a misnomer, since it is not a bug but a Tenebrionid beetle. When disturbed the beetle stops and points its posterior end up and at the end it produces a drop of a strong foul smelling fluid. *Abolus verrucosus* is one of the long-lived species and has a cuticle that is as hard as the Iron Clad beetle, another Tenebrionid. Many of these species become active late at night.

## Trichoptera

Trichoptera or caddisflies look very similar to their closest relatives, the moths. The biggest difference is scales being present on wings for Lepidoptera, while the Trichoptera has hairs. Caddisflies hold their antennae together straight in front when they rest, while moths generally have their antennae not necessarily held together out in front. All caddisflies have larvae that require water. Only four species were found on EAFB. It is surprising that one of the species was only encountered at a site a long distance from water.

## Lepidoptera

The Lepidoptera or butterflies and moths are the third largest order found on EAFB. They can be told by the presence of scales on the two pairs of wings. There are probably many more species present than have been described. The Microlepidoptera are one of the most species-rich groups in North America with many undescribed species. Unfortunately, the species of Microlepidoptera are small and are distinguished by genital characters, which always require microdissections.

Many of the species of Lepidoptera feed on specific plants as larvae. Those moths that feed on plants with restricted ranges also have restricted ranges like the definition here of a unique species. Many of the Geometrids have restricted food plants, such as species that feed upon *Eriogonum*. There is a species of Geometridae, *Singlochis perumbraria*, which feeds specifically on the Creosote. The Sphingidae, *Euproserpinus phaeon* and *Pachysphinx occidentalis*, also feed on specific plants, *Camissonia* species and *Populus* species, respectively. The Lycaenidae are far more variable in their choice of food plants. For instance, *Strymon melinus* feeds on more than 50 plant families, while *Euphilotes bernardino* feeds only on *Eriogonum fasciculatum*.

The Noctuidae are species-rich and well-studied, so their identification can be useful and accomplished more easily than most other families of moths. Ninety species of Noctuid moths were collected over the 3 years of this survey. This number represented nearly 6 percent of the total insect species identified. Many of the food plants of the Noctuid species as well as other moths are listed in Tietz (1972). For the reason that these moth species are so well known, new species can be easily identified. New species will therefore have relatively restricted ranges because of the fact that if the new species were not previously observed, the only explanation would be they had ranges restricted to the military base. One of the *Catocala* species, *C. versilluana*, feeds specifically on Oaks, which are not found on EAFB or anywhere near the base. The specific food plant for *Libytheana bachmanii*, Hackberry, is not found within 161 km (100 miles) of EAFB.

There were 10 species of Nymphalids observed during this study. One of the species observed during 1998, *Precis coenia*, was not observed during the prior 4-year period, 1994 to 1997. The range of *Charidryas neumogeni* on EAFB is also somewhat surprising, since its food plant *Xylorhiza tortifolia* has an extensive range throughout the higher elevation of the base. *Charidryas neumogeni* extends west to the hills on the northeast side of Rogers Dry Lake, while the food plant extends further west through the Rosamond Hills. The Checkerspot was not found in that area of the Rosamond Hills, although its food plant was common in the area. It is interesting that *Polygona satyrus* was found in the vicinity of its food plant, *Urtica* species at Piute ponds.

There are a number of species of Pieridae. Most of the species feed upon members of the Brassicaceae. One species of Pierid, *Nathalis iole* was not previously observed on base. This is particularly surprising, since the base has been surveyed for the 4-year period of 1994 to 1997. This Pierid feeds on composite annuals.

*Apodemia mormo* has two distinct races at EAFB. These races are not sympatric, but come close to one another in the Rosamond Hills. *Apodemia mormo* near *virgulti* is specifically associated with *Eriogonum fasciculatum* and extends east to the north end of Rosamond Dry Lake, while *Apodemia mormo deserti* extends west to the hill on the northeast end of

Leuhman Ridge. *Apodemia mormo deserti* feeds specifically on *Eriogonum inflatum*.

There was only one species of Saturnid found on EAFB. This species was *Hemileuca burnsi*. This medium-size moth feeds on *Tetradymia* (Asteraceae) and *Psorothamnus* (Fabaceae). It appears to prefer one of these food plants over the other at each locality. The males are active late in the afternoon.

## Diptera

The true flies are the second largest or species-rich orders on EAFB. The Assilidae, or Robber flies, are the second most complex and species rich of the desert arthropods. Some of these species are highly specialized as to the larval host. As adults they are relatively nonspecific predators. Because authorities familiar with the group identified the species, identifications to species are believed to be reliable. Some of the species are small and others can be quite large.

The *Apiocera* as a group of flies are relatively large in size. *Rhaphiomidas acton* was the largest fly found on base and was until very recently considered to be an Apiceridae. Some authorities now classify *Rhaphiomidas* as members of the Mydidae, rather than Apiceridae. Very little is known of the biology of this species although it is quite common in southern California.

The beeflies or Bombyllidae are important species of the desert. They have been well-named since many of them mimick bees. The species vary greatly in size from barely visible with the naked eye to some of the largest flies. This survey recorded 52 species on EAFB, which represented over 3 percent of the total species. Only a few of the species have been well-studied. In all cases they have been determined to be parasites of other insects. Because of their specialization there can be some unique species with restricted ranges on EAFB.

The blowflies or Calliphoridae are important in the breakdown of dead animals. These flies are often metallic green and as adults are important food for the larvae of various Spicid wasps. The Cecidomiidae are flies that form galls on plants. Collecting these plant galls could have obtained many more species. The Ceratopoginidae are called no-see-ums. These are tiny biting flies that can leave welts, which do not match the size of the flies.

The Chironomidae species all have aquatic larvae and should be part of the aquatic arthropod part of this EAFB survey, examined by other personnel. At least 10 morpho-species of Chironomids were found by this survey. These species were largely associated with aquatic habitats. There may be two times this number of species present at EAFB. Identification of these



species is based on their legs which are very delicate, unlike the crane flies which are identified by wing patterns.

The Culicidae and Simuliidae (mosquitoes and blackflies, respectively), both have aquatic larvae. The adults can fly some distances from their aquatic habitats as observed in this survey. The Tabanidae also require semiaquatic habitats and live in moist soils. The Dolichopodidae and Ephydriidae are shore inhabiting flies. Some of these species may fit the category of having restricted ranges. Larvae of many of the Heleomyzidae, Mycetophilidae, and other fly families are specifically adapted to and feed on mushrooms and other fungi.

Sciomyzidae feed specifically on snails and may be adapted to specific species. Of the Sarcophagidae, *Blaesoxipha plinthopyga*, is probably the most common. This species constantly flies around and lands on people who are walking in or along the edge of the desert. It is a relatively large gray and black striped fly with a red posterior end.

The Syrphidae are flies that have larvae that feed upon aphids and other Homoptera. This is a relatively species-rich family and there are many more species to be expected on EAFB than were identified during this survey. The Tachinidae is another complex genus, with many species that look very similar to one another. These insects are typically parasitic on other insects, so each also requires the presence of a host species. They vary greatly in size and there are probably many species on EAFB.

The Tephritidae of California feed largely upon various Asteraceae. Most species live in the flowers, but some form galls in plants. Probably many more species could be found at the EAFB by searching among the flower heads of composites late in their fruiting stages. Such a collection would not only provide the different fly species, but their parasites.

Another species-rich group that may be under represented in this survey is the crane flies or Tipulidae. These are large flies that are usually found mainly in the winter and spring. One species, *Dactylolabis vestigipennis*, is wingless. This species was found around a dune system at site 2c.

## Hymenoptera

There are many bees found in the desert. The families of bees found at EAFB are Megachilidae, Apidae, Anthophoridae, Andrenidae, Halictidae, Colletidae, and Melittidae. Most of these bees can be collected from flowers. Some are specific to the species of flower. As a group they represent 107 species or about 7 percent of the total arthropod species found during this survey. They can be separated from other Hymenoptera by the presence of branched hairs or setae on the body. There are probably many more species in this group at the EAFB than have been identified to date.

Another group of hymenopterans are the chalcid wasps which are tiny parasites or parasitoids (insect parasites). The important families are Chalcididae, Encyrtidae, Eulophidae, Eupelmidae, Eurytomidae, Mymaridae, Orymyridae, Perilampidae, Pteromalidae, Trichogrammatidae, and Torymidae. The Trichogrammatidae are not represented in this study, but the author has collected individuals in this group just to the east of EAFB in the Kramer Hills. These wasps often parasitize butterfly and moth eggs. The Trichogrammatidae were reared from *Apodemia mormo deserti* eggs from the Kramer Hills. A single egg, which is about the size of a pinhead, can produce as many as five adult wasps.

Many of the other families of chalcid wasps are also parasitoids, but there are some exceptions. Some of the Eurytomidae are called seed chalcids and have larvae that feed specifically on seeds. Some of the species of Perilampidae are even secondary parasites or parasitoids of other parasitoids. The ecologies of these species are extremely complex.

There are many other families of parasitic wasps. These parasitoids include Bethyridae, Braconidae, Chrysididae, Gasterupidae, Ichneumonidae, Megaspilidae, Platygasteridae, Pompilidae, Proctotrupidae, and Scelionidae. The Gasterupidae are rare and were only found at one site. The Braconidae and Ichneumonidae are extremely large families and there are probably many more species on EAFB that are left to be discovered. The Pompilidae, or spider wasps, are also species rich. The Tarantula Hawk or *Pepsis chrysothemia*, a member of the spider wasps, is rather common and found at a number of localities. This is one of the largest wasps found on base.

The ants (Formicidae) are a very species-rich family. There are probably a number of other species not known from EAFB. *Camponotus semitestaceus*, or carpenter ants, are the largest species found on base. The acrobat ants, *Crematogaster* species, are quite distinctive with their triangular abdomens. The *Pheidole* species are quite interesting in their diverse forms. The soldiers are about three times the size of the workers and have a head that is several times in proportion to the size of the body. There are several species of Harvester ants, *Messor pergandei*, *Pogonomyrmex californica*, and *Pogonomyrmex rugosus*.

The Velvet ants (Mutillidae) and Tiphid wasps (Tiphidae) are similar to one another. Many of the species of both are yellow to dark brown. The females of both families are wingless, whereas the males have wings. They can be told from one another by the presence of submarginal felt lines of the velvet ants and the presence of two lobelike metasternum projections of Tiphid wasps. The wingless females of both families, although they look like just ants, have very powerful stings.

The Sphecidae is a species-rich family. They are closely related to bees, but lack the branched hairs that distinguish Sphecid wasps from bees. The species vary greatly in size from very tiny wasps to extremely large species. There are 74 species of these wasps that represent about 5 percent of

the total species on EAFB. There are probably many more species to be found on base.

The Vespidae are the most similar to the Sphecidae. The Vespid wasps do not have the pronotal lobe of Sphecid wasps and have different wing venation. The paper wasps (*Polistes* spp.) and potter wasps (*Eumenes* species) are some of the species of Vespid wasps.

## New, Rare, or Unique Species

There are a number of new and unique invertebrate species found at EAFB. There were three Gryllacrididae that are new and undescribed species. Two may be restricted to the sand dune habitats of EAFB from just west of Branch Memorial Park and east to Kramer Hills. One of the species is an *Ammobaenetes* (Sand Treader), while the second is a species of *Stenoplematus* (Jerusalem Cricket). The records of the katydid, *Arethaea gracilipes*, may be a major range extension for the species. There are two Dune Roaches of the genus *Arenavaga* restricted to the same sand dune habitats as the Gryllacrididae. One of them may be a new species and also restricted to EAFB.

The *Enchenopa permutata* (Membracidae) specimen found around the northwest corner of EAFB may be a major range extension for the species. The Phymatid, *Macrocephalus camicoides*, is not common in the Mojave Desert. The author has not seen this species elsewhere in the Mojave. The beetle family Phengodidae, of which *Zarhipis integripennis* is a member, was collected on EAFB and is usually considered uncommon to rare. There were two new Scarabaeidae species, which also may be restricted to EAFB. These species belong to the genus *Serica*.

A new species of Assilidae, *Cerotainiops*, was collected from EAFB. It is possible that this species is restricted to EAFB. These have been collected both in 1996 and 1997. The Asteiidae, of which *Astiosoma aridum* is one, are thought of as very rare flies. An unusual wingless crane fly or tipulid, *Dactylolabis vestigipennis* (or *damula*) was collected in the sand dunes on the eastern end of the Rosamond Hills. This could be an unusual species for the region. A few *Gasteruption nevadae*, which are also considered quite rare, were collected on the southern edge of base.

## References

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- Andrews, F. G., Hardy, A. R., and Giuliani, D. (1979). "The coleopterous fauna of selected California sand dunes," Insect Taxonomy Laboratory, Division of Plant Industry, California Department of Food and Agriculture, 1220 N Street, Sacramento, CA.
- Ballmer, G. R. (1995). "What's bugging coastal sage scrub," *Fremontia* 23, 17-26.
- Borror, D. J., De Long, D. M., and Triplehorn, C. A. (1981). *An introduction to the study of insects*. Saunders College Publishing, 5th ed., Philadelphia, PA.
- Branchiopod Research Group. (1993). "Eubranchiopod Survey, Edwards Air Force Base, 1992-1993," University of San Diego, California.
- Charlton, D. (1995). Plant Species List of Edwards Air Force Base.
- Frommer, S. I. (1988). "A heirarchic listing of the arthropods known to occur within the deep canyon transect," University of California at Riverside, Entomology Research Museum.
- Hogue, C.L. (1974). "Insects of the Los Angeles Basin," Natural History Museum of Los Angeles County, Los Angeles, CA.
- Hurd, P. D., and Linsley, E. G. (1975). "Some insects other than bees associated with *Larrea tridentata* in the southwestern United States," *Proc. Entomol. Soc.* 77, 100-120.
- Longcore, T., Mattoni, R., Pratt, G., and Rich, C. "On the perils of ecological restoration: Lessons from the El Segundo Blue Butterfly" (in preparation) Keeley, Jon, Melanie Baer-Keeley, and C. J. Fotheringham, ed., 2nd Interface between Ecology and Land Development in California, International Association of Wildland Fire, Fairfield, WA.
- Mattoni, R. H. T. (1990). "Species diversity and habitat evaluation on the El Segundo sand dunes at LAX," Los Angeles Board of Airport Commissioners.

- McAlpine, J. F., Peterson, B. V., Shewell, G. E., Teskey, H. J., Vockeroth, J. R., and Wood, D. M. (1981). *Manual of Nearctic Diptera*. Canadian Government Publishing Centre Supply and Services, Canada Hull, Quebec, Canada K1A 0S9, Vol. 1-2.
- Pierce, W. D., and Pool, D. (1938). "The fauna and flora of the El Segundo sand dunes. I. General ecology of the dunes," *Bulletin of the Southern California Academy of Sciences* 37, 93-97.
- Pratt, G. (1987). Competition as a Controlling Factor of *Euphilotes batoides allyni* Larval Abundance (Lepidoptera: Lycaenidae). *Atala* 15, 1-9.
- \_\_\_\_\_. (1998). "Terrestrial invertebrates of Edwards Air Force Base, 1996," Technical Report EL-98-18, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- \_\_\_\_\_. (2000). "Terrestrial invertebrates of Edwards Air Force Base, 1997," Technical Report EL-98-18, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Strohecker, H. F., Middlekauff, W. W., and Rentz, D. C. (1968). "The grasshoppers of California," *Bull. Calif. Insect Surv.* 10, 1-177.
- Tietz, H. M. (1972). *An Index to the described life histories, early stages and hosts of the Macrolepidoptera of the Continental United States and Canada*. The Allyn Museum of Entomology, Sarasota, FL.
- Wheeler, C. G., and Wheeler, J. (1973). *Ants of deep canyon*. The Regents of the University of California.
- Wilson, E. O. (1992). *The Diversity of Life*. Belknap Press of Harvard University Press, Cambridge, Mass.
- Wootton, R. J. (1981). "Palaeozoic insects," *Ann. Res. Entomol.* 26, 319-344.

# Appendix A

## Species Collected

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\*The species preceded by an asterisk are new additions to the invertebrate list.

### Spiders

<u>Family</u>	<u>Localities</u> <sup>1</sup>	<u>Date</u>
<b>Agelenidae</b>		
* <i>Rualena</i> species nv.	8a, 9a	23 Nov 97
<b>Araneidae</b>		
<i>Metepeira foxi</i>	3a, 5c	4 Apr 96
	8b-c	16 Jun - 16 Aug 98
* <i>Neoanagraphis chamberlini</i>	6a	23 Nov 97
<i>Neoscoma oaxacensis</i>	3a	3 Jun 97
<b>Caponiidae</b>		
* <i>Tarsonops</i> species	6a	23 Nov 97
<b>Clubionidae</b>		
<i>Agroeca</i> near <i>omata</i>	3b	6 Jun 96
<i>Micaria</i> (immature)	5a	26 Jun 96
<i>Syspira</i> (immature)	1a	13 Jan 96
<b>Dictynidae</b>		
<i>Argenna</i> sp.	3b	2 Jun 96
<i>Dictyna palomara</i>	1a-b	6 Sep - 20 Oct 97
<i>Tricholathys monterea</i>	3a	3 Jun 97

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<sup>1</sup> See page A61.

<b>Filistatidae</b>		
<i>Kukulcania</i> sp.	1a	13 Jan 96
<b>Gnaphosidae</b>		
<i>Drassyllus insularis</i>	3a	3 Jun 97
	6a	18 Jun 98
<i>Drassyllus fractus</i>	6a	13 Jun 97
<i>Gnaphosa synthetica</i>	3a	3 Jun 97
<i>Herpyllus hesperolus</i>	3c	20 Nov 96
* <i>Haplodrassus dixiensis</i>	6a	18 Jun 98
<i>Scopoides naturalisticum</i>	9a	2 Aug 97
* <i>Zelotes griswoldi</i>	6a, 9a	23 Nov 97
<b>Lycosidae</b>		
<i>Allocasa subparva</i>	1a	6 Aug 96
* <i>Alopecosa kochii</i>	6a	18 Jun 98
<i>Pardosa</i> sp. (female)	3b	6 Jun 96
<i>Schizocosa mccooki</i>	3b	9 Oct 96
<b>Mimetidae</b>		
<i>Mimetus hesperus</i>	3b	6 Jun 96
	3b	11 Aug 97
	8b	19 Aug 98
<b>Oxyopidae</b>		
<i>Oxyopes tridens</i>	7a, 8a	7-13 May 97
<b>Philodromidae</b>		
<i>Philodromus infuscatus</i>	3d	22 Apr 97
<i>Thanatus altimontis</i>	3a	3 Jun 97
<i>Tibellus chamberlini</i>	3a	1 Sep 97
<i>Tibellus chamberlini</i>	3b	6 Jun - 11 Jul 96
<b>Pholcidae</b>		
<i>Psilochorus utahensis</i>	2c	13 Jun 96
	6a	18 Jun 98
<i>Psilochorus</i> sp.	3a	26 Feb 97
<b>Salticidae</b>		
<i>Habronattus icenoglei</i>	5a	29 Jun 96
<i>Habronattus signatus</i>	1b, 7b, 9a	29 Aug - 20 Sep 97
<i>Marchena minuta</i>	2c	13 Jun 96
* <i>Phidippus imm</i>	8b	19 Aug 98
<i>Pseudicius siticulosus</i>	3b	21 Sep 97
<b>Sicariidae</b>		
<i>Loxosceles deserta</i>	1a, 3c, 5b	1 Nov - 18 Apr 96
	2a, 6a, 7a	29 Jan - 12 Oct 97

### **Theridiidae**

<i>Dipoena abdita</i>	5b	26 Jun 97
<i>Euryopsis californica</i>	5a	29 Jun 96
	5b, 6a	13-26 Jun 97
<i>Latrodectus hesperus</i>	1a	8 Nov 96
	2a, 5b	15 May - 3 Jun 97
<i>Steatoda fulva</i>	2a, 7a	7 May - 3 Jun 97
	6a	18 Jun 98

### **Thomisidae**

<i>Misumenops deserti</i>	3a, 7b	3 Jun - 29 Aug 97
<i>Misumenops importunus</i>	1a, 3b	6-21 Sep 97
	8c	16 Jun 98
<i>Xysticus aprilius</i>	6a	5 Oct 97
<i>Xysticus californicus</i>	2a, 4b	9 Apr - 2 May 96
	6a	18 Jun 98

### **Scorpions**

<i>Hadrurus obsurus</i>	1a	16 Apr 96
<i>Hadrurus</i> sp.	6a	22 Aug 97
Species 1	6a, 10d	18 Jun - 19 Sep 98

### **Solpugidae**

Species 1	3b	3 Jun 97
Species 2	6a, 8b	15-18 Jun 98

### **Harvestman**

Species 1	9a	23 Nov 97
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### **Ticks**

<i>Dermacentor variabilis</i>	3b	3 Jun 97
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## Mites

Species 1	6a, 9a	23 Nov 97
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## Isopods (Pillbugs & Sowbugs)

Species 1	3c	20 Nov 96
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## Centipedes

Species 1	2a	29 Jan 97
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## Millipedes

<i>Orthoporus</i> sp.	2a, 4a	1 Nov - 29 Mar 96
	2a	29 Jan 97
	6a	18 Jun 98
Species 1	2a	29 Jan 97

## Insecta Collembola

### Entomobryiidae

Species 1	3a	18 Apr 96
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## Diplura

### Japygidae

Species 1	2a	29 Jan 97
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## Thysanura

### Lepismatidae

Species 1	1a, 5c	16 Apr - 9 May 96
Species 2	1a, 5c	16 Apr - 26 Jun 96
	1a, 2c, 6a, 9a	29 Jan - 23 Nov 97

### Machilidae

<i>Machilis</i> species	2c	13 Jun 96
	2c, 4a, 4c, 9a	23 Nov - 9 May 98

## Ephemeroptera

### Baetidae

<i>Baetis</i> species	2c	13 Jun 96
Species 1	1a	6 Sep 97

## Odonata

### Aeshnidae

<i>Aeshna multicolor</i>	1a, 3a, 3b	May - Sep 96
	1a	6 Sep 97
<i>Anax junius</i>	1a, 3a, 3b	Jun - Sep 96

### Libellulidae

<i>Libellula saturata</i>	1a, 2a	Jun - Aug 96
<i>Pantala hymenaea</i>	5b	May - Jun 96
<i>Pachydiplax longipennis</i>	1a, 3a, 3b	May - Aug 96
<i>Sympetrum corruptum</i>	1a, 2a, 3a-b, 4a, 5b	May - Oct 96
	7b	12 Oct 97
	8a	10 Jul 98
<i>Tramera lacerata</i>	1a, 3a, 3b, 4c	Jun - Aug 96
<i>Tramera onusta</i> (rare)	3a	Jun 96
	6a	13 Jun 97

### Coenagrionidae

<i>Enallagma carunculatum</i>	1a-c, 2a, 3a-c, 5a-c	Apr - Sep 96
	1a, 3a-b, 3d, 7b, 8a	11 Aug - 21 Sep 97
<i>Ischnura cervula</i>	1a, 3a, 3b	Mar - Oct 96
<i>Ischnura denticollis</i>	3a	Apr 96

# Orthoptera

## Acrididae

<i>Aeoloplides tenuipennis</i>	1a, 3a, 4b, 5a, 5c	13 Jun - 18 Sep 96
<i>Amphilitornus coloradus</i>	3a	11 Jul 96
<i>Anconia integra</i>	2b, 3a, 4c, 5a-b	29 Mar - 11 Sep 96
	1d, 6a	8 Apr - 22 Aug 97
<i>Boottettix argentatus</i>	2c, 4a	5 Jul - 18 Sep 96
	6a, 9a	2-22 Aug 97
	6a, 10b, 10d	29 Jul - 10 Sep 98
<i>Chimarocephala californica</i>	3a-b	4-18 Apr 96
	3a	21 Sep 97
<i>Cibolacris parviceps</i>	2b-c, 4a	2 Apr - 18 Sep 96
	6a	3 May - 13 Jun 97
	6a, 8b, 10c	1 May - 29 Jul 98
<i>Cordillacris occipitalis</i>	1a-c, 2b-c, 4c, 5a, 5c	15 May - 26 Jun 96
	6a, 8a, 9a	2 May - 22 Aug 97
	8b-c	16 Jun 98
<i>Derotimena delicatulum</i>	1a, 4a, 5a	26 Jun - 18 Sep 96
<i>Eremiacris pallida</i>	1a, 3a-c, 5a, 5c	5 Jul - 25 Sep 96
	8b-c	19 Aug 98
<i>Hesperotettix viridis</i>	1c, 3a-c, 5c	26 Jun - 11 Jul 96
	8a	16 Jul 97
	10b	29 Jul 98
<i>Ligurotettix coquilletti</i>	2b, 4a, 4c, 5a	13 Jun - 11 Sep 96
	7a	29 Aug 97
	10b, 10d	29 Jul 98
<i>Melanoplus cinereus</i>	4c, 5a	26 Jun - 5 Jul 96
	8a	16 Jul 97
<i>Melanoplus devastator</i>	2a, 5a	2 May - 5 Jul 96
<i>Melanoplus yarrowii</i>	3b	3-9 Oct 96
<i>Oedaleonotus enigma</i>	3c	11 Jul 96
<i>Opeia obscura</i>	3a	18 Apr - 11 Jul 96
<i>Poecilotettix sanguineus</i>	2b, 5a	15 May - 13 Jun 96
	9a	2 Aug 97
	10a, 10d	29 Jul 98
<i>Psoloessa delicatula</i>	1a-b, 2a-c, 3a, 3c, 4a, 5a-c	26 Jun - 11 Sep 96
	7b	29 Jun 97
<i>Schistocerca vaga</i>	3b	11 Oct 95
	5b	5 Jul 96
<i>Trimerotropis californica</i>	1b, 3b, 4a, 5a	6 Jun - 18 Sep 96
	1a, 8a, 9a	16 Jul - 6 Sep 97
	8c	19 Aug 98

<i>Trimerotropis inconspicua</i>	4a, 4b	5 Jul 96
<i>Trimerotropis pallidipennis</i>	1a, 2a-c, 3a-b, 4a-c, 5a	2 Apr - 17 Oct 96
	1a, 3a, 3d, 6a, 6b, 7a	8 Apr - 5 Oct 97
	6a, 8a-c, 9a, 10b	1 May - 10 Sep 98
<i>Trimerotropis pseudofasciata</i>	1a-5c	2 Apr - 8 Nov 96
	3a, 3b, 7b, 8a, 9a	7 May - 12 Oct 97
	6a, 8b-c	16 Jun - 19 Aug 98
<i>Trimerotropis rebellis</i>	1- 2c, 4a-5c	9 May - 8 Jul 96
	6b, 8a, 9a	22 May - 2 Aug 97
	6a	18 Jun 98
<i>Xanthippus olancha</i>	2b	2 May 96
<b>Gryllacrididae</b>		
<i>Ammobaenetes</i> n. sp.	1a	30 May 96
	6a	2 May 97
<i>Ceuthophilus californianus</i>	1a, 4c	Apr - May 96
<i>Ceuthophilus hesperus</i>	1a, 4c	Apr - May 96
<i>Ceuthophilus</i> n. sp.	6a	2 May 97
<i>Stenoplematus</i> n. sp.	1a, 5a	Jan - May 96
	1a	12 Feb 97
<b>Gryllidae</b>		
<i>Oecanthus californicus</i>	3b	21 Sep 97
<i>Gryllus assimilis</i>	1a, 2c, 3a-b, 4c, 5a, 5c	15 May - 11 Sep 96
	1a, 3a, 6a, 7a, 9a	7 May - 21 Sep 97
	6a, 8b, 10d	29 Jul - 10 Sep 98
<b>Tanaoceridae</b>		
<i>Tanaocerus koebelii</i>	2c	29 Mar 96
	8b	14 Mar 98
<b>Tettigoniidae</b>		
* <i>Arethaea gracilipes</i>	6a, 8b	18 Jun - 1 Jul 98
<i>Ateloplus luteus</i>	1a	8 Jul 96
	8a	16 Jul 97
	8b	10 Jul 98
<i>Capnobotes arizonensis</i>	4a	5 Jul 96
<i>Capnobotes fuliginosus</i>	4a, 4c	5 Jul 96
	7a	29 Jun 97
	8b	10 Jul 98
<i>Neduba ovata</i>	2c	2 May 96
	7a	7 May 97

<i>Insara covilleae</i>	8b	16 Jun 98
	2c	13 Jun 96

## Dictyoptera

### Mantidae

<i>Iris orata</i>	3a	11 Aug - 21 Sep 97
<i>Litaneutra minor</i>	1a, 5a, 3b	15 May - 8 Jul 96
	10a, 10d	29 Jul 98
<i>Stagmomantis californica</i>	3c	15 Sep 96
	7a, 8a, 9a	29 Aug - 20 Sep 97

### Polyphagidae

<i>Arenivaga apache</i>	1a, 2c, 4a, 5a	16 Apr - 11 Sep 96
	7a, 9a	29 Aug - 20 Sep 97
<i>Arenivaga</i> species	1a	6 Aug - 15 Sep 96
	10d	29 Jul 98
<i>Eremoblatta subdiaphana</i>	5a	11 Sep 96
	6a, 7a, 8a, 9a	2 Aug - 20 Sep 97

## Isoptera

### Rhinotermitidae

<i>Heterotermes</i> sp.	1a, 2b, 3a, 4a	Jan - Dec 96
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## Dermaptera

### Carcinophoridae

<i>Euborellia</i> sp.	1b	18 Mar 96
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## Psocoptera

### Trogiidae

Species 1	3d	21 Sep 97
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## Thysanoptera

### Thripidae

Species 1	3a	6 Jun 96
Species 2	3a	6 Jun 96

## Homoptera

### Acanaloniidae

<i>Acanolonia clypea</i>	1a	15 Sep 95
Species 1	8a	14 Sep 97

### Aphididae

Species 1	3b	11 Jul 96
	6a	5 Oct 97
Species 2	9a	20 Sep 97

### Cicadellidae

<i>Aceratogallia californica</i>	1a, 2a-b, 3b-c, 4a-b, 5a	11 Apr - 17 Oct 96
	1b, 3a, 3b, 7b, 8a	26 Feb - 27 Nov 97
<i>Acinopterus dulchellus</i>	5a, 5c	15 May - 11 Sep 96
<i>Acinopterus</i> sp.	5a-c	11 Apr 96
	1a	8 Apr 97
<i>Ballana</i> sp.	1a, 5c	11-16 Apr 96
	1a	6 Apr 97
<i>Cochlorhinus</i> sp.	5b	11 Apr 96
<i>Deltocephalus fuscinervosus</i>	3a	6 Jun 96
<i>Empoasca fabae</i>	3a-b, 5a	4 Apr - 26 Jun 96
	1a	6 Sep 97
<i>Norvellina</i> sp.	2c	13 Jun - 17 Oct 96
	7a	29 Jun - 29 Aug 97
	8b	10 Jul 98
<i>Opsius stactogalus</i>	1a-c, 3b-c, 5a-c	30 May - 6 Aug 96
	1a, 1d, 3b, 3d, 8a	11 Apr - 20 Oct 97
<i>Scaphytopius irroratus</i>	2a	17 Oct 96
	1d, 2d, 6b, 7a, 8a	22 Aug - 12 Oct 97
<i>Texananus oregonus</i>	2c, 3b	6-13 Jun 96
	7a	29 Jun 97
	8b	10 Jul 98
<i>Texananus</i> sp.	8a	14 Sep 97
<i>Xerophloea peltata</i>	3b	6 Jun 96

	1d	20 Oct 97
	8b	10 Jul 98
Species 1	3b, 5c	6 Jun - 11 Sep 96
Species 2	3b	11 Jul 96
Species 3	3b	18 Apr 96
Species 4	3a, 4a	9 May - 6 Jun 96
	2d, 8a	14 Sep 97
Species 5	5a	11 Apr 96
Species 6	4c	5 Jul 96
	6a, 8a	16 Jul - 14 Sep 97
	8b, 10d	10-29 Jul 98
Species 7	2a, 2c	13 Jun - 17 Oct 96
Species 8	8a	14 Sep 97
Species 9	1a, 7a	7 May - 6 Sep 97
Species 10	4a	5 Mar 97
Species 11	1a	6 Aug 97
Species 12	4c	5 Jul 97
Species 13	5a	15 May 97
Species 14	3b	6 Jun 96
	7a	29 Jun 97
Species 15	4a, 4b	18 Sep - 1 Nov 96
	3d, 6a, 7b	22 Apr - 5 Oct 97
<b>Cicadidae</b>		
<i>Okanagana vanduzeei</i>	4a	11 Jul 96
	8a-b, 9a, 10a-b	10-29 Jul 98
<b>Cixiidae</b>		
<i>Oecleus decens</i>	3b, 4a, 5b	9 May - 11 Sep 96
<i>Oliarus zyxus</i>	3b, 5b	11 Apr - 6 Jun 96
Species 1	5b	11 Sep 96
	3a	21 Sep 97
Species 2	6b	10 Sep 98
<b>Delphacidae</b>		
<i>Delphacodes</i> sp.	2c, 3a, 3b	6 Jun - 4 Sep 96
	3a	21 Sep 97
Species 1	3a	6 Jun 96
<b>Dictyopharidae</b>		
<i>Acinaca</i> sp.	2c	13 Jun 96
<i>Orgerius concordus</i>	5a	11 Sep 96
Species 1	9a	20 Sep 97
Species 2	8a	14 Sep 97
<b>Flatidae</b>		
<i>Ormenis saucia</i>	1a, 4b	5 Jul - 6 Aug 96
	7a, 8a	29 Aug - 14 Sep 97

Species 1	8b, 10b, 10d 1b	10-29 Jul 98 8 Jul 96
<b>Issidae</b>		
Species 1	3a	6 Jun 96
<b>Membracidae</b>		
<i>Enchenopa permutata</i>	8a	16 Jul 97
<i>Micrutalis</i> sp.	6a, 7b	29 Jun - 22 Aug 97
<i>Multareis cornutus</i>	4a-c	9 May - 5 Jul 96
	6a-b, 7a-b, 8a, 9a-b	3 May - 14 Sep 97
	6b, 8c, 10b	16 Jun - 29 Jul 98
<i>Multareoides bifurcatus</i>	2a, 4a, 4c	5 Jul - 1 Nov 96
	3d, 6a, 7a, 7b, 8a, 9a	22 May - 12 Oct 97
<b>Psyllidae</b>		
Species 1	3b	4 Apr 96
Species 2	7a	29 Aug 97
<b>Hemiptera</b>		
<b>Alydidae</b>		
<i>Alydus pluto</i>	1a, 3a, 3c	6 Jun - 11 Jul 96
<i>Tallius setosus</i>	2a, 3a	2 May - 6 Jun 96
<b>Anthocoridae</b>		
<i>Anthocoris</i> sp.	1c	8 Jul 96
<i>Orius tristicolor</i>	1a-b, 2a, 3a-c, 4a-b, 5a-c	4 Apr - 22 Oct 96
	1a-b, 5b, 6a-b, 7a-b, 8a, 9a-b	16 Jul - 8 Nov 97
	8a	21 May 98
Species 2	9a	20 Sep 97
<b>Coreidae</b>		
<i>Merocoris curtatus</i>	5b	11 Sep 96
<b>Corixidae</b>		
<i>Corisella decolor</i>	1a-b, 2c, 3b, 5a	18 Apr - 8 Nov 96
	1a, 3a-b, 6a, 7a, 8a, 9a	11 Apr - 21 Sep 97
	2b, 6a, 8b	14 Mar - 10 Sep 98



<b>Cydnidae</b>		
<i>Pangaeus conguus</i>	1a, 4c 2c	9 May - 8 Jul 96 27 Mar 97
<b>Largidae</b>		
<i>Largus californica</i>	1a, 7b	12-20 Oct 97
<b>Lygaeidae</b>		
<i>Emblethis vicarius</i>	1a, 2a 9a	29 Mar - 8 Jul 96 2 Aug 97
<i>Geocoris pallens</i>	1a-b, 2b, 3b, 4a, 5a 1a, 1d, 6a-b, 7a, 8a, 9a 6a-b, 8b-c, 9a, 10a, 10d	9 Apr - 22 Oct 96 8 Apr - 20 Oct 97 16 Jun - 19 Aug 98
<i>Lygaeus kalmii</i>	1a, 2b 8a	16 Apr - 13 Jun 96 13 May 97
* <i>Neacoryphus bicrucis</i>	9a, 10a	10-29 Jul 98
<i>Neacoryphus lateralis</i>	2c 8a, 9a 6a	17 Oct 96 16 Jul - 20 Sep 97 10 Sep 98
<i>Nysius tenellus</i>	1a, 2b-c, 3a-c, 4a, 5a-c 1a-b, 1d, 3a-b, 3d, 6a, 7a-b, 8a, 9a-b 8b, 9b, 10d	18 Mar - 22 Oct 96 2 May - 20 Oct 97 16 Jun - 29 Jul 98
<i>Pseudopamera nitidula</i>	2c, 4c 8b	29 Mar - 9 May 96 10 Jul - 19 Aug 98
* <i>Rhyparochromus saturnius</i>	8b, 10d	29 Jul - 19 Aug 98
<i>Xyonysius californicus</i>	3c	6 Jun 96
Species 1	1d	20 Oct 97
Species 2	1a-b, 2b, 3b, 6b	8 Apr - 20 Oct 97
<b>Miridae</b>		
<i>Atractotomus</i> species	2c	30 May 96
<i>Chaetophylidea moerens</i>	1a, 4c, 5a, 5c 6a, 9a	9-16 Apr 96 25 Mar - 1 May 98
<i>Chlamydatus monilipes</i>	2c, 4c 2c, 9a	29 Mar - 9 May 96 25 Mar 97
* <i>Coquillettia insignis</i>	8b	16 Jun 98
<i>Deraeocoris brevis</i>	2c	13 Jun 96
<i>Hadronema princeps</i>	2b, 4a, 5a	9 Apr - 2 May 96
<i>Hadronema princeps</i>	1a, 2c, 9a 8c, 10c	25 Mar - 8 Apr 97 21-26 May 98
<i>Haplomachides consors</i>	4c, 5a 9a	11 Apr - 9 May 96 25 Mar 98

<i>*Irbisia californica</i>	2b	14 Mar 98
<i>Irbisia</i> species 1	2b, 5c	2-15 May 96
	9a	25 Mar 97
<i>Lopidea confraterna</i>	2b, 4c, 5a	2-15 May 96
	3a, 6a-b	3 May - 21 Sep 97
	8c	16 Jun 98
<i>Orthotylus</i> sp.	1a, 3c	25 Sep - 9 Oct 96
<i>Parthenicus picicollis</i>	2a, 2c, 4a	9 May - 17 Oct 96
	6a-b, 7a, 9a	20 Sep - 12 Oct 97
<i>Parthenicus</i> species	2c	13 Jun 96
	6a, 8a, 7b, 9a	29 Aug - 5 Oct 97
	5b	16 Jun 98
<i>Phylloidea picta</i>	6a	1 May 98
<i>Phytocoris albidopictus</i>	1a, 2c, 4c	9 May - 13 Jun 96
	8a	13 May 97
<i>Phytocoris ingens</i>	4c	9 May 96
<i>Phytocoris plenus</i>	2c	13 Jun 96
<i>Phytocoris ramosus</i>	2c, 4c	2 Apr - 13 Jun 96
	2c, 6a-b, 7a,	
	9b	25 Mar - 12 Oct 97
	6a, 10c	1 May - 18 Jun 98
<i>Phytocoris vanduzeei</i>	4a, 4b	9 May 96
	6a	18 Jun 98
<i>Phytocoris</i> species 1	2c	25 Mar 97
	8a	21 May 98
<b>Phytocoris</b> species 2	1a	8 Nov 96
	1b	20 Oct 97
<i>*Phytocoris</i> species 3	6a, 8b	21 May - 18 Jun 98
<i>*Phytocoris</i> species 4	8b	16 Jun 98
<i>Pseudopsallus</i> species	5b	11 Apr 96
	9a	25 Mar 97
<i>Rhinocloa forticornis</i>	3c, 5a, 5c	11 Jul - 22 Oct 96
	1b, 1d, 2b	6 Sep - 20 Oct 97
<i>Spanagonicus albofasciatus</i>	1a	6 Aug 96
	6a	10 Sep 98
<i>Taylorilgus pallidulus</i>	1a-5c	9 Apr - 22 Oct 96
	1a, 1d, 3a-b,	
	3d, 6a-b, 7a-b,	
	8a, 9a	11 Apr - 5 Oct 97
	6a-b, 8b	16 Jun - 10 Sep 98
<i>Tropidosteptes</i> species	1a	8 Jul 98
Species 1	5a	11 Apr 96
Species 2	5a-c	11 Apr - 11 Sep 96
Species 3	1a, 5c	30 May - 11 Sep 96
Species 4	5b	11 Apr 96
Species 5	6b	5 Oct 97
Species 7	6a	5 Oct 97
	6a, 10c	26 May - 19 Jun 98
Species 8	2a, 7a	29 Jan - 12 Oct 97

Species 9	7a	12 Oct 97
Species 10	9a	20 Sep 97
Species 11	8a	14 Sep 97
Species 12	7b	29 Aug 97
Species 13	2d, 9a	14-20 Sep 97
*Species 14	4c, 6a, 8c	1 May - 18 Jun 98
Species 15	1a	6 Jun 95
Species 16	1c	8 Nov 96
*Species 17	6a	1 May 98
<b>Nabidae</b>		
<i>Nabis americoferus</i>	3a, 5a-b	11 Apr - 9 Oct 96
	1a	6 Aug 97
	8b	16 Jun - 10 Jul 98
<b>Notonectidae</b>		
<i>Notonecta kirbyi</i>	2c	13 Jun 96
<b>Pentatomidae</b>		
<i>Acrosternum hilare</i>	2b	2 Aug 96
<i>Brochymena sulcata</i>	5b	26 Jun 96
<i>Chlorochroa sayi</i>	1a, 2c, 3a-c, 4a-c, 5a, 5c	2 Apr - 11 Sep 96
	1b, 1d, 8a	13 May - 20 Oct 97
	6a, 8b	10-18 Jul 98
<i>Dendrocoris contaminatus</i>	2a, 4a, 4c	2-9 May 96
	2d, 6a, 7a, 9a	2 May - 12 Oct 97
	8c	19 Aug 98
<i>Perillus splendidus</i>	2b	2 May 96
<i>Tepa brevis</i>	3a, 4b	9 Apr - 6 Jun 96
<i>Thyanta custator</i>	2c	13 Jun 96
	8a	14 Sep 97
	6a, 8b, 10d	10 Jul - 10 Sep 98
<i>Thyanta pallidovirens</i>	3b, 4c	11 Jul - 2 Aug 96
<b>Phymatidae</b>		
<i>Macrocephalus camicoides</i>	9a	20 Sep 97
	8c	16 Jun 98
<b>Reduviidae</b>		
<i>Apiomerus</i> sp.	6b, 7a, 8a	3-13 May 97
	6a	1 May 98
<i>Rasahus biguttatus</i>	3b	6 Jun 96
<i>Sinea complexa</i>	1a	6 Jun 97
<i>Sinea diadema</i>	1b, 3a, 3c	6 Jun - 9 Oct 96
	3a	21 Sep 97
<i>Zelus renardii</i>	1a, 1c, 2a, 3a-c, 5b-c	6 Jun - 9 Oct 96

3a, 3d, 6a 29 Aug - 21 Sep 97  
10a 29 Jul 98

### Rhopalidae

*Arhyssus lateralis* 2a-b, 3a, 4a-b 29 Mar - 11 Jul 96  
1a, 3a, 3d, 6a 2 May - 21 Sep 97  
8c 16 Jun 98  
*Arhyssus scutatus* 5c 11 Apr 96  
*Aufeius impressicollis* 3a 11 Jul 96  
1a, 7b 29 Aug - 6 Sep 97  
*Boisea rubrolineata* 3b 11 Jul 96  
*Harmostes reflexus* 1a, 2a, 3b-c,  
5a-b 29 Mar - 25 Sep 96  
*Liorhyssus hyalinus* 2b, 3c, 4a-b 9 Apr - 1 Nov 96  
6a-b, 8b-c, 9a 1 May - 10 Sep 98  
6a 18 Jun 98

\*Species 1

### Saldidae

*Saldula pallipea* 3a-b, 5c 4 Apr - 11 Jul 96  
3a 20 Nov 97

### Threocoridae

*Corimelaena lateralis* 3b 11 Jul 96

### Tingidae

*Corythucha morrilla* 5a 11 Apr 96  
1b, 2d, 3a, 8a,  
9a 6-21 Sep 97  
*Leptonypha minor* 5c 26 Jun 96

## Neuroptera

### Inocellidae

*Inocella inflata* 3b 11 Apr 96

### Chrysopidae

*Chrysopa coloradensis* 1a 6 Aug 96  
*Chrysopa comanche* 5b 11 Apr 96  
*Chrysopa nigricornis* 1a 8 Jul - 6 Aug 96  
*Chrysopa oculata* 5a 11 Apr 96  
*Chrysopa plorabunda* 1a 8 Jul 96  
1a, 3a-b 11 Apr - 21 Sep 97  
*Eremochrysopa tibialis* 1b, 3b-c, 4c,  
5b-c 9 Apr - 9 Oct 96  
9a 20 Sep 97  
6a 23 Nov 97  
*Pimachrysa albicostales* 4a 1 Nov 96

**Coniopterygidae**

Species 1	6a, 7b, 9a	22 Aug - 20 Sep 97
Species 2	7a	29 Aug 97

**Hemerobiidae**

<i>Hemerobius pacificus</i>	1a	30 May 96
<i>Micromus subanticus</i>	3b	9 Oct 96
<i>Micromus variolosus</i>	9a	20 Sep 97

**Myrmeleontidae**

* <i>Brachynemuris pulchellus</i>	6a, 8b, 10d	29 Jul - 10 Sep 98
<i>Brachynemuris sackeni</i>	5a	11 Apr 96
	1d, 6a	8 Apr - 5 Oct 97
	6a	1 May 98
<i>Clathroneura coquilletti</i>	1a, 3b, 4c, 5a	6 Jun - 11 Sep 96
<i>Scotoleon carrizonus</i>	1a, 2c, 3b, 4c	13 Jun - 4 Sep 96
	7a, 9a	29 Aug - 20 Sep 97
	6a, 10d	29 Jul - 10 Sep 98
<i>Scotoleon fidelitus</i>	3a, 7a, 8a, 9a	29 Aug - 21 Sep 97
	6a	10 Sep 98
<i>Scotoleon longipalpis</i>	1a-b, 2c, 3b,	
	4a, 4c	13 Jun - 4 Sep 96
	6a, 7a, 8a, 9a	16 Jul - 20 Sep 97
	6a, 8b-c, 10d	10 Jul - 10 Sep 98
<i>Scotoleon minusculus</i>	7b	29 Aug 97
<i>Scotoleon pallidus</i>	6a, 8a, 9a	2 Aug - 20 Sep 97
	6a	10 Sep 98
<i>Scotoleon quadripunctatus</i>	1a	8 Jul 96
<i>Scotoleon singularis</i>	1a, 5a	11-25 Sep 96
	1a, 7b	29 Aug - 6 Sep 97
	8a	14 Sep 98

**Coleoptera****Alleculidae**

<i>Hymenorus montivagos</i>	1a, 3b	30 May - 11 Jul 96
	8b	10 Jul 98

**Anobiidae**

<i>Megorama ingens</i>	1a	8 Jul 96
<i>Tricorynus mutans</i>	2c	13 Jun 96
<i>Xeranobium desertum</i>	1a	6 Aug 96
<i>Xeranobium laticeps</i>	2c, 4c	5 Jul - 4 Sep 96
	8a	6 Jun 97
Species 1	2c	13 Jun 96
Species 2	1a, 2c	8 Jul 96
Species 3	1a, 3b	6 Jun - 8 Jul 96

Species 4	2c, 6a, 7a 6a, 8b	25 Mar - 7 May 97 18 Jun - 10 Jul 98
<b>Anthicidae</b>		
<i>Anthicus nanus</i>	4b	5 Jul 96
<i>Anthicus punctulatus</i>	1a, 3b 9a 8b	8-11 Jul 96 2 Aug 97 10 Jul 98
<i>Notoxus calaratus</i>	1a	8 Jul 96
<i>Notoxus robustus</i>	3b	6 Jun 96
<i>Omnadus floralis</i>	2c, 5a	4-11 Sep 96
<i>Vascusus confinus</i>	3b, 5a-c	26 Jun - 11 Jul 96
Species 1	2c, 3b 3b, 7a	13 Jun - 11 Jul 96 2 Jun - 29 Aug 97
Species 2	7a	7 May 97
<b>Bostrichidae</b>		
<i>Apatides fortis</i>	1a	6 Sep 97
<i>Scobicia</i> sp.	1a	6 Aug - 25 Sep 97
Species 1	1a	25 Sep 96
<b>Bruchidae</b>		
<i>Acanthoscelides</i> sp.	1b-c, 5a-b	11 Apr - 8 Jul 96
<i>Algarobius prosopis</i>	1a, 5b 1a, 7b	11-25 Sep 96 7 May - 20 Oct 97
<i>Mimosestes protractus</i>	5b	11 Sep 96
Species 1	2a	13 Jun 96
Species 2	3b	6 Jun 96
Species 3	8a	14 Sep 97
<b>Buprestidae</b>		
<i>Acmaeodera lanata</i>	2a, 3a, 4a, 5a-b 7a	2 May - 13 Jun 96 7 May 97
<i>Acmaeodera labyrinthica</i>	1a, 5a 6a-b	11 Apr - 6 Jun 96 18 Jun 98
<i>Acmaeodera lucia</i>	6b, 9a	22 May - 13 Jun 97
<i>Acmaeodera quadrivittata</i>	6a	22 Aug 97
<i>Acmaeodera relifera</i>	6a, 7b	3-7 May 97
<i>Acmaeodera sphaeralceae</i>	8a	13 May 97
<i>Anambodera santarosae</i>	6a	2 May 97
<i>Agrilus blandus</i>	2c	22 May 97
<i>Agrilus gibbicollis</i>	1b	22 May 97
<i>Chrysobothris atriplexae</i>	7b	7 May 97
<i>Chrysobothris debilis</i>	5b	15 May 96
<i>Chrysobothris deserta</i>	8a	16 Jul 97
<i>Chrysobothris lucana</i>	9a	2 Aug 97
<i>Chrysobothris pupureoplagiata</i>	7a	7 May 97

<i>Hippomelas fulgida</i>	3b	2 Aug 96
	7b	29 Aug 97
<i>Hippomela obliterated</i>	4a-c	5 Jul 96
	7a-b	29 Aug 97
	8b	19 Aug 98

### Carabidae

<i>Agonoderus maculatus</i>	2c, 4c	8 Jul - 16 Aug 96
<i>Agonum funebre</i>	3a, 3b	18 Apr - 11 Jul 96
	3a	26 Feb 97
	8b	10 Jul 98
<i>Anisodactylus</i> sp.	1a, 3b	5 Jul - 5 Sep 96
	6a	18 Jun 98
<i>Armara insignis</i>	2a	2 May 96
	1a, 2a, 2c, 3b,	
	9a	29 Jan - 20 Nov 97
	9a	21 Mar 98
<i>Bembidion bifossulatum</i>	3a-b	4 Apr - 11 Jul 96
	3a-b	26 Feb - 11 Apr 97
<i>Bembidion insulatum</i>	3b	18 Apr 96
<i>Bembidion variegatum</i>	3b	18 Apr - 2 Aug 96
	3a	26 Feb - 29 Aug 97
<i>Bembidion</i> sp.	1a	6 Aug 97
<i>Bradycellus nitidus</i>	3a	4 Apr 96
<i>Callisthenes lariversi</i>	2a	29 Jan 97
	2b, 6a-b, 8a-c,	
	9a, 10c	14 Mar - 18 Jun 98
<i>Calosoma peregrinator</i>	2c	25 Mar 97
	6a, 8b	1-21 May 98
<i>Celia californica</i>	1a, 5c	11-16 Apr 96
<i>Celia</i> sp.	1a, 3a-b	4 Apr - 11 Jul 96
<i>Feronia isabellae</i>	3b	20 Nov 97
<i>Harpalus lascivus</i>	3a	4 Apr 96
	3a	26 Feb - 21 Sep 97
<i>Lebia perita</i>	3b	6 Jun 96
* <i>Rhadine gracilenta</i>	6a	23 Nov - 18 Jun 98
<i>Stenolophus flavipes</i>	3b	11 Apr 97
<i>Tetragonoderus pallidus</i>	1a	8 Apr 97
Species 1	3b	11 Jul 96
	8b	10 Jul 98
Species 2	3a	4 Apr 96
Species 3	3b	11 Jul 96
	3a	26 Feb 97
*Species 4	8b	10 Jul 98
*Species 5	8b	10 Jul 98

### Cerambycidae

<i>Amanus pectoralis</i>	3a	6 Jun 96
<i>Aneflomorpha</i> sp.	6a	22 Aug 97

<i>Crossidius coralinus</i>	3a, 3c	11 Jul - 11 Oct 96
<i>Crossidius hirtipes</i>	1c	11 Oct 96
<i>Crossidius suturalis</i>	1a	15-25 Sep 96
	3b	11 Aug 97
<i>Derobrachus geminatus</i>	1a	8 Jul - 14 Aug 96
	8a	16 Jul 97
* <i>Plionoma rubens</i>	6b	18 Jun 98

### Chrysomelidae

<i>Acalymma trivittata</i>	1a	15 Sep 97
<i>Altica carinata</i>	1a	18 Mar 96
	7b	7 May 97
<i>Chaetocnema ectypa</i>	3a-c	6 Jun - 11 Jul 96
	1a	6 Sep 97
<i>Diabrotica undecimpunctata</i>	2c, 3a-b, 4c	6 Jun - 9 Oct 96
	1a, 3b	15-21 Sep 97
<i>Galerucella xanthomelaena</i>	1a, 2a, 3b, 4c	2 May - 6 Aug 96
* <i>Galerucella species</i>	8c	16 Jun 98
<i>Neochlamisus sp.</i>	8a	14 Sep 97
<i>Pachybrachys desertus</i>	2c, 4a, 4c	13 Jun - 1 Nov 96
	6a, 7a-b, 8a,	
	9a	22 Aug - 12 Oct 97
	6a-b, 8c, 10d	29 Jul - 10 Sep 98
<i>Phyllotreta sp.</i>	1a, 2c	13 Jun - 8 Jul 96
	1d, 9a	20 Sep - 20 Oct 97
	8a, 8c	21 May - 16 Jun 98
<i>Saxinus saucia californica</i>	4c, 9b	13 May - 5 Jul 97
<i>Stenopodius sp.</i>	9a	22 May 97
Species 1	1a, 3b	2-6 Aug 96
Species 2	1a, 2b	2 May - 8 Jul 96
	1b, 2d, 8a, 7b,	
	9a	13 May - 20 Sep 97
*Species 3	8b	21 May 98

### Cicindelidae

<i>Cicindela haemorrhagica</i>	3a-b	6 Jun - 9 Oct 96
	3b	11 Aug 97
<i>Cicindela oregona</i>	1a, 3a-b	4 Apr - 3 Oct 96
<i>Cicindela tranqueberrica</i>	3b	9 Oct - 4 Apr 96
	3d	21 Sep 97
<i>Cicindela willistoni</i>	3b	6 Jun 96
	3b	22 Apr - 2 Jun 97

### Cleridae

<i>Cymatodera oblita</i>	1a, 4a	6 Aug - 18 Sep 96
	7a	29 Aug 97
	6a	10 Sep 98
<i>Cymatodera punctata</i>	1a	6 Aug 96
	9a	2 Aug 97



	8b, 10d	10-29 Jul 98
<i>Enoclerus laetus</i>	1a, 1b, 5b	11-25 Sep 96
<i>Loedelia maculicollis</i>	4a	9 May 96
<i>Phyllobaenus scaber</i>	4c	9 May 96
	6a, 9a-b	2 May - 2 Aug 97
<i>Trichodes ornatus</i>	2a, 4a-b	2-9 May 96
	2d, 6a	2-13 May 97
	6a, 8c	16-18 Jun 98
<b>Coccinellidae</b>		
<b>Brumoides septentrionis</b>	8a	16 Jul 97
<i>Coccinella novemnotata</i>	3a-b	6 Jun - 3 Oct 96
	2c, 3b, 3d, 8a,	
	9b	25 Mar - 21 Sep 97
	6a, 8c	21 May - 18 Jun 98
<i>Hippodamia convergens</i>	1a, 2b, 3a-c,	
	5c	18 Mar - 3 Oct 96
	3b, 6a, 8a	22 Apr - 16 Jul 97
	2a-b, 6a, 8a-c,	
	10c-d	14 Mar - 18 Jun 98
<i>Hippodamia</i> sp.	4c	9 May 96
<i>Hyperaspis</i> sp	2a	17 Oct 96
<i>Olla v-nigrum</i>	1a	6 Aug 96
	3b, 7a	7 May - 21 Sep 97
Species 1	6a	2 May - 22 Aug 97
Species 2	3d, 8a	14-21 Sep 97
	6a	10 Sep 98
Species 3	3a-b	21 Sep 97
<b>Curculionidae</b>		
<i>Anthonomus</i> sp.	1b, 8a, 9a	6-20 Sep 97
<i>Apleurus angulans</i>	3a, 4a, 5b	11 Jul - 1 Nov 96
	7b	29 Aug 97
<i>Ophryastes argentatus</i>	4a	5 Jul 96
	7a-b	29 Jun - 29 Aug 97
	10b	29 Jul 98
<i>Ophryastes geminatus</i>	1a	13 Jan 97
	10d	26 May 98
<i>Sibinia setosus</i>	1b	8 Jul 96
	1a	6 Sep 97
<i>Smicronyx imbricatus</i>	1a	8 Jul 96
Species 1	9a	22 May 97
	6a, 10b	18 Jun - 29 Jul 98
Species 2	9a	20 Sep 97
<b>Dermestidae</b>		
<i>Anthrenus lepidus</i>	1a, 3a-b, 5a-b	18 Mar - 6 Jun 96
	1a, 1d	8 Apr 97
<i>Attagenus rufipennis</i>	5b	11 Apr 96

	2c, 9b	13-22 May 97
<i>Cryplorhopalum apicale</i>	4b	9 May 96
	7a, 8a	7-13 May 97
<i>Dermestes marmoratus</i>	1a	6 Aug 96
	9a	2 Aug 97
	8b	10 Jul 98
<i>Novelsis uteana</i>	1a	30 May - 8 Jul 96
<i>Trogoderma variabile</i>	2a-c, 4c	2 May - 5 Jul 96
Species 1	2c, 7a, 9a-b	7 May - 16 Jul 97
<b>Dytiscidae</b>		
<i>Copelatus chevrolati</i>	3b	11 Apr 97
<i>Hygrotus</i> sp.	1d	18 Apr 96
<b>Elateridae</b>		
<i>Aeolus</i> sp.	3b	6 Jun 96
	8b	10 Jul 98
* <i>Aphricus</i> species 1	6a	18 Jun 98
* <i>Aphricus</i> species 2	10d	29 Jul 98
<i>Conoderus falli</i>	1a	6 Aug 97
<i>Esthesopus dispersus</i>	2c	13 Jun 96
<i>Horistonotus fidelis</i>	5a	15 May 97
<i>Horistonotus inanus</i>	1a	18 Mar 96
<i>Horistonotus pallidus</i>	7a, 8a, 9a	29 Jun - 2 Aug 97
	8b	10 Jul 98
<i>Octinodes frater</i>	2c, 4c	2 Apr - 9 May 96
	7a, 8a	7-13 May 97
	10d	26 May 98
<i>Octinodes shaumi</i>	1a, 4c, 5a	9 May - 8 Jul 96
	6a, 8b	18 Jun - 10 Jul 98
<b>Helodidae</b>		
<i>Cyphon variabilis</i>	3b	11 Jul - 2 Aug 96
	3b	11 Apr 97
<b>Heteroceridae</b>		
<i>Heterocerus gnatho</i>	1a, 2a, 3b, 5a	30 May - 11 Sep 96
	3b, 7a	11 Apr - 29 Aug 97
<b>Hydrophilidae</b>		
<i>Berosus punctulatus</i>	3b	11 Jul - 2 Aug 96
	6a	10 Sep 98
<i>Berosus</i> species	3b	11 Jul 96
	3b, 7a	11 Apr - 7 May 97
	6a, 8b	10 Jul - 10 Sep 98
<i>Enochrus</i> species	1a, 6a, 7a	22 Aug - 6 Sep 97
<i>Hydrophilus triangularis</i>	3b	11 Jul - 2 Aug 96
	3b	11 Aug 97
<i>Troposternus lateralis</i>	3b	11 Jul 96

Species 1	9a	20 Sep 97
*Species 2	8b	19 Aug 98
<b>Lathridiidae</b>		
Species 1	6a	5 Oct 97
<b>Meloidae</b>		
<i>Cordylospasta opaca</i>	4a, 5b	9-11 Apr 96
	2c	25 Mar 97
<i>Cysteodemus armatus</i>	5a	9 May 96
	6a, 8c, 10c	1 May - 18 Jun 98
<i>Epicauta corybantica</i>	1a-b, 3a-c	25 Sep - 22 Oct 96
<i>Epicauta puncticollis</i>	3c	6 Jun 95
<i>Eupompha elegans</i>	1a, 5a	15-30 May 96
	6a, 8b-c, 9a,	
	10c	1 May - 10 Jul 98
<i>Lytta auriculata</i>	1c	16 Apr 96
	1a	8 Apr 97
	6a	1 May 98
<i>Lytta magister</i>	4a	9 May 96
	6a, 8b-c, 10c	21 May - 18 Jun 98
<i>Lytta stygica</i>	2c	29 Mar 96
	2c, 9a	25 Mar 97
<i>Lytta vulnerata</i>	1c, 3a	11 Oct 96
<i>Nemognatha macswaini</i>	4a	9 May 96
	6a, 8c, 9a	21 May - 10 Jul 98
<i>Pleurospasta mirabilis</i>	1a, 3b	6 Jun 96
* <i>Tearodera latecincta</i>	5c	late Jul 98
<i>Zonitis atripennis</i>	1a	25 Sep 96
<b>Melyridae</b>		
<i>Amecocerus</i> sp. 1	1c, 4a, 4c, 5b	9-16 Apr 96
	8b, 10c	26 May - 16 Jun 98
<i>Amecocerus</i> sp. 2	4c	9 May 96
<i>Attalus difficilis</i>	5a	11 Apr 96
	4b	18 Sep 97
<i>Attalus oregonensis</i>	1b, 2a, 3b, 4a,	
	4c, 5a, 5c	9 May - 26 Jun 96
	2c-d, 6a, 7a-b,	
	8a, 9b	7 May - 16 Jul 97
	8c	16 Jun 98
<i>Attalus santarosae</i>	4a-b	9 May 96
<i>Attalus</i> species 1	8a	16 Jul 97
<i>Attalus</i> species 2	2c	22 May 97
* <i>Attalus</i> species 3	8b	16 Jun 98
<i>Attalus</i> species 4	9a	25 Mar 97
<i>Collops limbellus</i>	5a	15 May 96
<i>Emmenotarsus</i> species 1	2b, 5a	27 Mar - 11 Apr 96
	8c	21 May 98

<i>Eschatocrepis constrictus</i>	1a, 2a-b, 4a-b, 5b-c	29 Mar - 11 Sep 96
	2b, 6a, 8c	14 Mar - 16 Jun 98
<i>Eutrichopleurus mucidus</i>	3a, 5a-b	11 Apr - 6 Jun 96
<i>Pristoscelis irwini</i>	4b, 5c	9 May - 11 Sep 96
<i>Pristoscelis schlingeri</i>	1a, 5a-c	11-16 Apr 96
<i>Pristoscelis</i> species	2a	2 May 96
<i>Tanaops lobulatus</i>	2a	2 May 96
	2c	22 May 97
Species 1	2c	25 Mar 97
Species 2	1a, 1d, 6a, 7a-b, 8a, 9a-b	25 Mar - 13 May 97
Species 3	6a, 7a-b, 9b	2-13 May 97
Species 4	8a	16 Jul 97
Species 5	4a	5 Mar 97
Species 6	4a-b, 6a, 8a	5 Mar - 2 May 97
Species 7	2a	29 Mar 96
Species 8	7a	29 Jun 97
<b>Mordellidae</b>		
<i>Anthobates nubilis</i>	5b-c	11 Sep 96
<i>Mordella albosutura</i>	2a, 4c	2-9 May 96
	2d, 6b, 7a-b	3-13 May 97
	6a-b, 8b-c, 9a	16 Jun - 10 Jul 98
<i>Mordellistena</i> sp. 1	1a, 4c	16 Apr - 9 May 96
<i>Mordellistena</i> sp. 2	1a	8 Jul 96
<b>Mycetophagidae</b>		
Species 1	4c	5 Jul 96
<b>Nitidulidae</b>		
Species 1	1a	6 Aug 96
	6a, 9a	2-22 Aug 97
	9a	23 Nov 98
<b>Oedemeridae</b>		
<i>Rhinoplatia ruficollis</i>	4a	9 May 96
	6a	3 May 97
	6a-b, 8c, 10c	21 May - 18 Jun 98
<i>Oxacis</i> sp.	1a, 9a	8 Apr - 2 Aug 97
<b>Phengodidae</b>		
<i>Zarhipis integripennis</i>	2c	25 Mar 97
<b>Ptinidae</b>		
Species 1	9a	23 Nov 97

**Scarabaeidae**

<i>Aphodius lividus</i>	1a, 5a	6 Aug - 25 Sep 96
	1a, 7a, 9a	29 Aug - 20 Sep 97
	6a	10 Sep 98
<i>Coenonycha pallida</i>	4a	5 Mar 97
<i>Cremastocheilus schaumii</i>	1b	18 Mar 96
<i>Cyclocephala longula</i>	1a, 3b	30 May - 16 Aug 96
	8b	10 Jul 98
<i>Diplotaxis subangulata</i>	1a, 5a	8 Jul - 15 Sep 96
	6a, 7a, 9a	7 May - 2 Aug 97
	6a, 8b, 10d	10 Jul - 10 Sep 98
<i>Gymnopyge hopliaeformis</i>	2b, 4a	2-9 May 96
	6a-b, 10c	26 May - 18 Jun 98
<i>Lygyrus gibbosus</i>	1a, 3b	11 Jul - 25 Sep 96
	6a, 7a	3 May - 29 Aug 97
	6a, 10d	29 Jul - 10 Sep 98
<i>Paracotalpa ursina</i>	1a	12 Feb 97
<i>Phobetus mojavus</i>	4c	9 May 96
<i>Polyphylla decemlineata</i>	7a	29 Jun 97
* <i>Serica elongatula</i>	4a, 5a	9-15 May 96
	6b, 8b	16 Jun - 10 Jul 98
<i>Serica</i> species 1	5a	15 May 96
<i>Serica</i> species 2	8a	13 May 97
Species 1	7a	7 May 97

**Staphylinidae**

<i>Betonuchus</i> species	3b	11 Jul 96
<i>Coproporus</i> species	2c	13 Jun 96
	7a	7 May 97
<i>Philonthus cruentatus</i>	1a, 2c, 3b, 5a	30 May - 11 Sep 96
	6a	18 Jun 98
Species 1	2c	13 Jun 96
	9a	20 Sep 97
	8b	10 Jul 98
Species 2	1a	25 Sep 96
	3b, 7a	11 Apr - 29 Aug 97
	8b	10 Jul 98
Species 4	9a	2 Aug 97
Species 5	7a	7 May 97

**Tenebrionidae**

<i>Abolus verrucosus</i>	1a, 2c, 3b	2 Apr - 6 Aug 96
	1a, 5a-b, 8a,	
	9a	12 Feb - 6 Sep 97
	6a, 8b	23 Nov - 10 Jul 98
<i>Agorporis</i> species	2a	29 Mar 97
<i>Aloephus</i> species	2a	13 Jun 96
	7a, 9a	29 Jun - 2 Aug 97
<i>Apsena rufipes</i>	5c	15 May 96

	3b	22 Apr 97
<i>Araeoschizus andrewsi</i>	1a	30 May 96
	3a	22 Apr 97
<i>Asidina</i> sp.	1a	12 Feb 97
<i>Auchmobius picipes</i>	1c	8 Jul 96
	8a	13 May 97
	9a	10 Jul 98
<i>Blapstinus pulverulentus</i>	1a-b, 3b, 5a	16 Apr - 2 Aug 96
	1a	8 Apr 97
<i>Blapstinus</i> species	1a	16 Apr - 6 Aug 96
	8b	10 Jul 98
<i>Coniontis ellyptica</i>	3a-c	18 Apr - 11 Jul 96
	3d	22 Apr 97
<i>Coniontis parviceps</i>	1a, 7a, 9a	12 Feb - 2 Aug 97
<i>Coniontis</i> species	2c	29 Mar 96
	2a, 9a	29 Jan - 22 May 97
<i>Cryptoglossa muricata</i>	7a	7 May 97
* <i>Cryptoglossa laevis</i>	6a, 10d	18 Jun - 29 Jul 98
<i>Edrotes ventricosus</i>	1a-c, 4a, 5a,	
	8a	12 Feb - 14 Sep 97
<i>Eleodes armata</i>	1a-5c	1 Jan - 31 Dec 96
	1a, 2a, 3c, 7a,	
	8a, 9a	29 Jan - 6 Sep 97
	6b-c, 8b, 10d	14 Mar - 10 Sep 98
<i>Eleodes</i> species 1	1a-b, 2c, 3b,	
	5a-b	29 Mar - 8 Nov 96
	1a-b, 2c, 5a,	
	8a, 9a	13 Jan - 20 Oct 97
	6a	23 Nov - 18 Jun 98
<i>Eleodes</i> species 2	1c	8 Nov 96
<i>Edrotes ventricosus</i>	1a, 5c	25 Sep - 11 Apr 96
	6a, 8c	1-21 May 98
<i>Eupsophus castaneus</i>	7a	7 May 97
	6a, 8b	16-18 Jun 98
<i>Eusattus dubius</i>	2c	29 Jan - 25 Mar 97
<i>Eusattus muricatus</i>	1a-b, 5b	18 Mar - 6 Jun 96
	1a-b	12 Feb 97
<i>Metopoloba</i> sp.	1a	6 Aug - 15 Sep 96
<i>Philolithus actuosus</i>	2c	4 Sep 96
	2a, 7a, 8a, 9a	29 Jan - 12 Oct 97
<i>Trogloderus costatus</i>	1a, 5a	16 Apr - 16 Aug 96
	1a	12 Feb 97
	6a	18 Jun 98
Species 1	2a, 2c, 4c, 5a,	
	5c	29 Mar - 5 Jul 96
	3b, 8a	2 Jun - 16 Jul 97
Species 2	2c	29 Mar 96
Species 3	2c	4 Sep 96
	9a	2 Aug 97

Species 4	9a	2 Aug 97
*Species 5	9a	23 Nov 97
*Species 6	8b	16 Jun 98

## Tricoptera

### Hydropsychidae

Species 1	2c	13 Jun 96
	9a	20 Sep 97
	8b, 9a	10 Jul - 20 Sep 98
Species 2	1a	30 May 96

### Leptoceridae

Species 1	2c	13 Jun 96
Species 2	1a	6 Aug 96

## Lepidoptera

### Arctiidae

<i>Apantesis proxima</i>	1a, 3b	11 Jul - 20 Nov 96
	3b	18 Apr - 11 Aug 97

### Blastobasidae

Species 1	4a	5 Mar 97
	6a	1 May 98

### Cochylidae

<i>Aethes</i> species	2c	2 Apr 96
<i>Cochylis yuccatana</i>	2c	29 Jan 97
Cochylini species	8a	14 Sept 97

### Coleophoridae

<i>Coleophora</i> sp. 1	2a	2 May 96
	8a	14 Sept. 97
<i>Coleophora</i> sp. 2	3a, 4a	5 Mar - 14 Sep 97
<i>Coleophora</i> sp. 3	2c, 4a	5-25 Mar 97

### Cosmopterigidae

<i>Stagmatophora iridella</i>	7a	7 May 97
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### Cossidae

<i>Comadia henrici</i>	6a	2 May 97
<i>Givira mucida</i>	2c	13 June - 4 Sep 96
	6a, 7a	7 May - 29 Aug 97
	6a, 10c	29 July - 10 Sep 98

- <i>Hypopta palmata</i>	3b	5 Jul - 2 Aug 96
	6a, 9a	2-22 Aug 97
	10c	29 July 98
<i>Hypopta</i> species	1a	30 May 96

### Gelechiidae

<i>Aristotelia</i> species	1a	30 May 96
<i>Arotrura eburnean</i>	2c, 5a	2 Apr - 15 May 96
<i>Arotrura sponsella</i>	4b, 5a	9 May - 22 Oct 96
<i>Arotrura</i> species 1	2c, 4a	5-25 Mar 97
<i>Arotrura</i> species 2	7a, 9a	7 May - 20 Sep 97
<i>Arotrura</i> species 3	6a	5 Oct 97
<i>Aroga paulella</i>	4a	5 Mar 97
<i>Chionodes abdominella</i>	4a	May 96
	3b, 6a	3 May - 2 Jun 97
<i>Chionodes kincaidella</i>	5a	22 Oct 96
<i>Chionodes ochreisrigella</i>	3d	20 Nov 96
<i>Chionodes</i> species 1	2c	13 Jun 96
<i>Chionodes</i> species 2	1a	30 May 96
<i>Filatima</i> species	2c	13 Jun 96
<i>Gnorimoschema coquilletellum</i>		
	9a	20 Sep 97
<i>Lita incicur</i>	5a	22 Oct 96
	7a, 9a	20 Sep - 12 Oct 97
<i>Lita puertella</i>	1a, 7a	12-20 Oct 97
<i>Lita</i> sp. 1	6a, 7a	5-12 Oct. 97
Species 1	4a, 6a	5 Mar - 5 Oct 97
Species 2	7a	7 May 97
Species 3	1a, 8a, 9a	14 Sep - 20 Oct 97
	10d	29 Jul 98
Species 4	7a	8 Apr 97
	10d	1 May 98

### Geometridae

* <i>Archirohoe neomexicana</i>	8b, 10d	16 Jun - 29 Jul 98
<i>Chlorochalmys appellaria</i>	5a	11 Sep 96
<i>Eupithecia deserticola</i>	2c	29 Jan 97
<i>Glaucina baea</i>	7a	29 Aug 97
<i>Glacina erroraria</i>	2c	13 Jun 96
	2c, 7a, 9a	25 Mar - 20 Sep 97
	6a, 8b, 10d	18 Jun - 10 Sep 98
<i>Glaucina loxa</i>	8a	16 Jul 97
<i>Hesperumia sulphuria</i>	3b	6 Jun 96
<i>Lithostege deserticola</i>	4a	1 Nov 97
<i>Lobocleta ossularia</i>	1a	25 Sep 97
<i>Narraga fimetaria</i>	1a	8 Jul 96
	8a	14 Sep 97
<i>Nasusina minuta</i>	1a	30 May 96
	2c	25 Mar 97



<i>Paraglaucina hulstinoides</i>	9a	20 Sep 97
<i>Perizoma custodiata</i>	4c, 5a	9 May - 22 Oct 96
	1a, 2c, 4a	5 Mar - 9 Apr 97
	4a	1 Nov 97
<i>Pero meskaria</i>	1a	6 Aug 96
<i>Plataea diva</i>	2c	25 Mar 97
<i>Semiothisa californiaria</i>	2c	29 Jan 97
<i>Semiothisa colorata</i>	2c, 4c	2 Apr - 13 Jun 96
	1a, 2c, 4a, 6a,	
	7a, 8a, 9a	29 Jan - 14 Sep 97
	6a, 8b, 10d	5 Oct - 10 Sep 98
<i>Semiothisa cyda</i>	1a	30 May - 6 Aug 96
	1b	6 Sep 97
<i>Semiothisa excurvata</i>	8a, 9a	16 Jul - 2 Aug 97
<i>Singlochis perumbraria</i>	2c, 4a, 7a, 8a,	
	9a	5 Mar - 20 Sep 97
	6a, 8b, 9a	2 Nov - 10 Sep 96
<i>Synchlora aerata</i>	1a	8 Jul - 6 Aug 96
	3b	2 Jun 97
<i>Yermoia perplexa</i>	2c	29 Jan 97

#### Hesperidae

<i>Atalopedes campestris</i>	3b	6 Jun - 11 Oct 96
	3b	11 Aug 97
<i>Erynnis funeralis</i>	1c	11 Oct 96
<i>Helioptes ericetorum</i>	1c	11 Oct 96
	9a	22 May 97
<i>Hylephileus phyleus</i>	3b	2 Aug - 9 Oct 96
	3b	11 Aug 97
<i>Pholosora libya</i>	1a-b, 2a, 5a-b	15 May - 15 Sep 96
<i>Polites sabuleti</i>	1a, 3a-b	6 Jun - 11 Oct 96
	3b	18 Apr - 11 Aug 97
<i>Pseudocopaeodes eunis</i>	1a-b, 3a-c	19 Apr - 11 Oct 96
	3a-b	18 Apr - 2 Jun 97
<i>Pyrgus albescens</i>	1a, 2a, 3a-b	30 May - 6 Jun 96
	9a	22 May 97
	6c, 8a	21 May - 10 Jul 98
<i>Pyrgus scriptura</i>	9a	22 May 97
	6c	10 Jul 98

#### Incurvariidae

<i>Adela punctiferella</i>	4b	5 Mar 97
<i>Caucas trifascia</i>	4b	5 Mar 97
<i>Prodoxus sordidus</i>	4c, 8a	5 Mar - 14 Sep 97
<i>Tegeticula paradoxa</i>	4c	5 Mar 97

#### Lasciocampidae

<i>Malacosoma incurvum</i>	2c, 3b	6-13 Jun 96
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**Lycaenidae**

<i>Brephidium exilis</i>	1a-5c	18 Mar - 20 Nov 96
	1a-b, 1d, 2c,	
	3a-b, 3d, 4a,	
	5a-c, 6a, 7a-b,	
	8a, 9a-b	26 Feb - 29 Aug 97
	7a, 7c, 7d, 8a,	
	8b, 8c, 10a,	
	10b, 10d	30 Apr - 29 Jul 98
<i>Euphilotes bernardino</i>	2d, 7a	7-13 May 97
<i>Icaricia acmon</i>	2b, 3b, 3c	29 Mar - 6 Jun 96
	10c	26 May 98
<i>Leptotes marinus</i>	1a	6 Jun - 6 Aug 96
<i>Strymon melinus</i>	1b, 3c, 5a-b	30 Mar - 11 Sep 96
	8a	10 Jul 98

**Lobythiidae**

<i>Libytheana bachmanii</i>	1a	8 Nov 96
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**Nepticulidae**

<i>Stigmella</i> species	3b	6 Jun 96
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**Noctuidae**

<i>Abagrotis barnesi</i>	3b, 4c	9 May - 9 Oct 96
	10c	29 Jul 98
<i>Abagrotis nefascia</i>	6a	2 May 97
<i>Abagrotis trigona</i>	1a, 2c	6 Aug - 4 Sep 96
	7a	29 Aug 97
* <i>Acroncosa albiflavella</i>	8b	19 Aug 98
<i>Agrotis ipsilon</i>	1a, 3b, 4a	30 May - 9 Oct 96
	9a	20 Sep 98
* <i>Agrotis orthogonia</i>	3b	21 Sep 98
<i>Archanara alameda</i>	3b	11 Jul 96
<i>Archanara</i> species	1a, 3b	8 Jul - 6 Aug 96
<i>Aseptis monica</i>	2c	25 Mar 97
<i>Aseptis perrumosa</i>	2c, 3d	6-13 Jun 96
<i>Autographa californica</i>	1a, 5a	22 Oct - 8 Nov 96
	4a	5 Mar 97
<i>Bulia deducta</i>	1a	8 Jul 96
* <i>Canochares acutus</i>	6a	1 May 98
<i>Canochares arizonae</i>	1a, 2c	13 Jul 96
	6a, 8b	18 Jun - 5 Oct 98
<i>Catocala aholibah</i>	2c	25 Mar 97
<i>Catocala junctura</i>	1a	15 Sep 96
* <i>Catocala versilluana</i>	8b	19 Aug 98
<i>Copicuculia eulipes</i>	8a	16 Jul 97
	1a	6 Aug 96
<i>Copicuculia heinrichi</i>	2c	25 Mar 97
<i>Discestra fulgora</i>	2c	25 Mar 97

	6a	1 May 98
<i>Eigra curialis</i>	2c	29 Jan - 25 Mar 97
<i>Euxoa atomaris</i>	1a, 3a, 6a, 7a, 8a, 9a	14 Sep - 20 Oct 97
<i>Euxoa auxiliaris</i>	1a	6 Aug 96
	1a, 6a, 9a	8 Apr - 5 Oct 97
<i>Euxoa biformata</i>	1a	6 Aug 96
<i>Euxoa idahoensis</i>	1a	16 Apr 96
<i>Euxoa messoria</i>	1a	6 Aug 96
<i>Euxoa misturata</i>	5a	22 Oct 96
<i>Euxoa olivia</i>	1a, 2c, 3b, 4c, 5a	9 May - 20 Nov 96
	1a, 3b, 4a, 7a	9 Oct - 1 Nov 97
	6a	1 May 98
<i>Euxoa reclusa</i>	1a, 2c, 5a, 5c	17 Oct - 8 Nov 96
	1a, 4a, 7a	12 Oct - 1 Nov 97
<i>Euxoa selenis</i>	1a, 2c, 3b	25 Mar - 22 Apr 97
<i>Euxoa septembionalis</i>	1a	6 Aug 96
<i>Euxoa serricornis</i>	1a	16 Apr 96
	2c, 6a	25 Mar - 2 May 97
	6a	1 May 98
<i>Euxoa silens</i>	1a, 5c	9-30 May 96
<i>Heliothis paradoxis</i>	3b	11 Jul 96
* <i>Heliothis phloxiphagus</i>	8b	19 Aug 98
<i>Heliothis zea</i>	3b, 6a	22 Aug - 9 Oct 97
	6a, 8b	1 May - 10 Sep 98
<i>Heliolonche pictipennis</i>	1a, 5b	11-18 Apr 96
<i>Helotropha reniformis</i>	3b	11 Jul 97
	3b	6 Jun - 2 Aug 96
<i>Heteranassa fraterna</i>	1a, 5a	30 May - 11 Sep 96
<i>Lacinipolia illaudabilis</i>	4c	9 May 96
<i>Lacinipolis leucogramma</i>	1a	25 Sep 96
<i>Manruta elingua</i>	4a	1 Nov 96
* <i>Melipotis indomita</i>	10c	29 Jul 98
<i>Neogrotella spaldingi</i>	1a	25 Sep 96
<i>Oncocnemis augustus</i>	4a	1 Nov 96
<i>Peridroma saucia</i>	1a, 3b, 4a	5 Mar - 11 Aug 97
<i>Ponometia megocula</i>	4a, 6a	5 Mar - 5 Oct 97
<i>Protogygia biclavus</i>	4a	5 Mar 97
<i>Protogygia enalaga</i>	1a	8 Apr 97
<i>Protorthodes alfkeni</i>	1a, 2c, 3b, 4a, 5a	11 Sep - 17 Oct 96
	1a, 3b, 7a, 8a	29 Aug - 9 Oct 97
<i>Protorthodes texana</i>	2c	17 Oct 96
<i>Proxenus mindara</i>	3b, 7a	11-29 Aug 97
<i>Psuedaletia farcta</i>	1a, 3b	6 Jun - 6 Aug 96
<i>Psuedaletia unipuncta</i>	1a, 4a	6 Aug - 18 Sep 96
<i>Pseudanarta crocea</i>	2c	17 Oct 96
<i>Pseudanarta flava</i>	2c	17 Oct 96

<i>Pseudohadena vulnera</i>	4c	9 May 96
	4a, 6a, 7a	5 Mar - 7 May 97
	6a, 8b	16-18 Jun 98
<i>Pseudorthostia variabilis</i>	3b	21 Sep 97
<i>Rancora comstocki</i>	2c	29 Jan 97
* <i>Rhizagrotis cloanthoides</i>	1a, 4c	9-30 May 96
	6a	3 May 97
	6a	18 Jun 98
<i>Rhynchagrotis exsertistigma</i>	2c, 3b, 6a, 7a	25 Mar - 7 May 97
	6a	18 Jun 98
<i>Schinia argentiafascia</i>	1a	25 Sep 96
* <i>Schinia citrinella</i>	6a	10 Sep 98
<i>Schinia dobla</i>	4a	9 Apr 96
<i>Schinia erosa</i>	6a, 9a	20 Sep - 5 Oct 97
<i>Schinia ligeae</i>	2c	25 Mar 97
	6a	1 May 98
* <i>Schinia mortua</i>	8b	19 Aug 98
<i>Schinia oleagina</i>	1a	
	6a	10 Sep 98
* <i>Schinia scarletina</i>	8b	18 Jun 98
<i>Schinia separata</i>	1a, 2c, 3b	25 Sep - 17 Oct 96
	8a	14 Sep 97
* <i>Schinia unimacula</i>	3c	21 Sep 98
<i>Scotogramma ptilodonta</i>	5a	11 Sep 96
<i>Scotogramma yakima</i>	1a, 3b, 3d, 5a,	
	5c	6 Jun - 20 Nov 96
	1a	20 Oct 97
	3c	21 Sep 98
<i>Setagrotis radiatus</i>	6a	2 May 97
<i>Spaelothis chandestina</i>	1a, 2c	13 Jun - 17 Oct 96
<i>Spaelotis havilae</i>	2c	2 Apr 96
	1a, 2c, 6a, 7a	8 Apr - 5 Oct 97
	6a	1 May 98
<i>Spodoptera exugua</i>	1a, 4a, 5a	6 Aug - 22 Oct 96
	3b, 4a, 7a, 8a,	
	9a	2 Aug - 1 Nov 97
	3c, 6a, 8b, 9a	21 Sep - 10 Sep 98
<i>Spodoptera frugiperda</i>	1a	20 Oct 97
<i>Spodoptera praefica</i>	1a, 4a	5 Mar - 20 Oct 97
<i>Synedoida ochracea</i>	4a	18 Sep 96
<i>Synedoida tejonica</i>	5a	11 Sep 96
<i>Trichocerapoda oblita</i>	2c	17 Oct 96
<i>Trichoclea postica</i>	1a	8 Apr 97
<i>Trichoplusia ni</i>	1a, 4a, 5a	11-25 Sep 96
	6a	10 Sep 98
<i>Trichopolia dentatella</i>	6a, 7a-b, 9a	20 Sep - 12 Oct 97
<i>Tridepia nova</i>	1a, 2c, 3b, 4a	13 Jun - 18 Sep 96
	3b, 6a, 9a	11 Jul - 22 Aug 97
	6a	10 Sep 98

<i>*Tristyla alboplagiata</i>	6a	18 Jun 98
<i>Tryocnemis saporis</i>	4c	9 May 96
	6a	10 Sep 98
<i>Trudestra arida</i>	1a, 2c, 3b, 5a	6 Jun - 20 Nov 96
<i>Walterela ocellata</i>	2c	29 Jan 97
<b>Nymphalidae</b>		
<i>Charidryas neumogeni</i>	4a-b	9 Apr - 9 May 96
<i>Danaus gilippus</i>	1c	11 Oct 96
<i>Danaus plexippus</i>	1a, 3b	18 Mar - 9 Oct 96
	3b	11 Aug 97
<i>Nymphalis antiopa</i>	1a, 3b	18 Mar - 6 Jun 96
	3b	2 Jun 97
<i>Polygonia satyrus</i>	3b	11 Jul 96
<i>Vanessa atlanta</i>	2a, 3b	30 Mar - 9 Oct 96
<i>Vanessa annabella</i>	1a-c, 3b, 4c	18 Mar - 11 Oct 96
	3b	18 Apr - 2 Jun 97
	6b, 7a, 9a, 9c,	
	10c	20 Mar - 26 May 98
<i>Vanessa cardui</i>	1c, 2a-b, 3a-b,	
	4a-c, 5c	18 Mar - 11 Oct 96
	4a-c	5 Mar 97
	2d, 6b, 7a, 9a,	
	9c, 10c	20 Mar - 21 May 98
<i>Vanessa virginiensis</i>	2a	30 Mar 96
<i>*Precis coenia</i>	6b	18 Jun 98
<b>Papilionidae</b>		
<i>Papilio rutulus</i>	1a	30 May 96
<b>Oecophoridae</b>		
<i>Elachista species</i>	2c	29 Jan 97
<i>Inga cretacea</i>	7a	7 May 97
<i>Pleurota albastrigulella</i>	2c	25 Mar 97
<b>Pieridae</b>		
<i>Anthocharis cethura</i>	1a, 2a, 3a, 4a,	
	5a	29 Mar - 11 Apr 96
	3b, 4a-c	26 Feb - 5 Mar 97
	2d	20 Mar 98
<i>Artogeia rapae</i>	3b	4 Apr - 2 Aug 96
	3b	2 Jun - 11 Aug 97
<i>Colias eurytheme</i>	1a, 3c	2 Aug - 11 Oct 96
<i>Euchloe hyantis</i>	1a-b, 2a-b, 3a,	
	3c, 4a-b, 5a-c	29 Mar - 11 Apr 96
	3b, 4a-c, 5a	18 Feb - Mar 97
	2d	20 Mar 98
<i>*Nathalis iole</i>	6b	18 Jun 98
<i>Pontia protodice</i>	1a, 2a, 3a-c,	

	4a-c, 5a-b	15 Mar - 17 Oct 96
	3a-b, 3d, 7b,	
	8a, 9a	25 Mar - 11 Aug 97
	2d, 7a, 7c, 7d,	
	8a, 10c	20 Mar - 10 Jul 98
<b>Plutellidae</b>		
<i>Plutella nr albidorsella</i>	2c	25 Mar 97
<i>Plutella xylostella</i>	1a, 2c, 4a	5 Mar - 20 Oct 97
<i>Ypsolopha delscatella</i>	6a, 8a	14 Sep - 5 Oct 97
<i>Ypsolopha</i> sp. 1	2c	25 Mar 97
<b>Psychidae</b>		
<i>Oiketicus</i> species	2b-c	Eclosed cocoons only
<b>Pterophoridae</b>		
<i>Oidaematophorus fishii</i>	2c	25 Mar 97
	6a	1 May 98
<i>Oidaematophorus</i> species	2c, 4c	9 May - 17 Oct 96
Species 1	2c, 4a, 6a, 9a	5 Mar - 20 Sep 97
Species 2	2c	25 Mar 97
<b>Pyralidae</b>		
<i>Achyra rantalis</i>	1a	6 Aug 96
<i>Achyra</i> sp. 1	3b	11 Aug 97
<i>Alpheias</i> sp. 1	7a	29 Aug 97
<i>Arivaca artella</i>	1a	30 May 96
<i>Epheatia kuchniabla</i>	2c	13 Jun 96
<i>Euchromius ocelleus</i>	1a, 3b	11 Aug - 20 Oct 97
<i>Eugnosta</i> species	2c	29 Jun 97
<i>Eumysia</i> sp.	3b	21 Sep 97
<i>Frechinia laetalis</i>	9a	20 Sep 97
<i>Hymenia</i> species	3b	9 Oct 96
<i>Loxostege cereralis</i>	1a, 4a	18-25 Sep 96
	9a	2 Aug 97
<i>Loxostege stricticalis</i>	5a	11 Sep 96
	7a	7 May - 29 Jun 97
	6a	18 Jun 98
<i>Lygropia octonalis</i>	3d	2 Aug 96
<i>Myelopsis alatella</i>	1a	16 Apr 96
<i>Nomophila nearctica</i>	1a, 2c	18 May - 8 Nov 96
	7a	12 Oct 97
	8b, 9a	23 Nov - 14 Mar 98
<i>Passodena flavidorsella</i>	2c, 8a	25 Mar - 14 Sep 97
<i>Phobus</i> species	2c	13 Jun 96
<i>Pima abiplagiatella</i>	2c	25 Mar 97
<i>Prorasea sideralis</i>	4a	18 Sep 96
	2c, 4a, 6a, 9a	5 Mar - 5 Oct 97
<i>Pseudoschoenobius</i> sp. 1	4a	5 Mar - 20 Sep 97

<i>Rhagea packardella</i>	6a	2 May 97
* <i>Sarata pullatella</i>	9a	23 Nov 97
* <i>Sosipatra</i> species 1	6a, 10d	29 Jul - 10 Sep 98
<i>Sosipatra</i> species 2	2c, 4c	2 Apr - 9 May 96
<i>Spoladea recuralis</i>	3b	9 Oct 96
Species 1 (Phycitinae)	2c	25 Mar 97
Species 2 (Phycitinae)	6a	22 Aug 97
Species 3 (Phycitinae)	9a	20 Sep 97
Species 4 (Phycitinae)	4a	5 Mar 97
*Species 5	10d	29 Jul 98
*Species 6	10d	29 Jul 98
Species 7	2c	25 Mar 97
*Species 8	8b	16 Jun 98
<b>Riodinidae</b>		
<i>Apodemia mormo deserti</i>	4a-b	9 May 96
	6a	13 Jun 97
	6a	30 Apr 98
<i>Apodemia mormo nr virgulti</i>	2a-b	2 May 96
	2d	13 May 97
	2d	21 May 98
<i>A. palmeri</i>	1a, 5b	15 May - 6 Jun, 11-16 Sep 96
<b>Saturnidae</b>		
<i>Hemileuca burnsi</i>	1a-c, 4a	18-25 Sep 96
	8a, 9a	14-20 Sep 97
<b>Scythrididae</b>		
Species 1	8a	16 Jul 97
Species 2	8a	13 May 97
Species 3	7b	7 May 97
Species 4	9a	20 Sep 97
<b>Sphingidae</b>		
<i>Euproserpinus phaeton</i>	1a	29 Jan - 18 Mar 96
	2b, 3b, 5a	29 Jan - 26 Feb 97
<i>Pachysphinx occidentalis</i>	1a	6 Aug 96
	8b	19 Aug 98
<i>Hyles lineata</i>	1a	8 Apr 97
<b>Tineidae</b>		
<i>Acrolophus variabilis</i>	4a, 5a	11-18 Sep 96
	6a, 8a	22 Aug - 14 Sep 97
	6a, 8b, 10d	29 Jul - 10 Sep 98
<i>Acrolophus</i> sp. 1	2c, 3b	11 Aug - 4 Sep 97
	8b	19 Aug 98
<i>Acrolophus</i> sp. 2	6a	22 Aug 97
<i>Amydria</i> species	2c, 4c	2 Apr - 9 May 96

Species 1	1a, 5a	11-25 Sep 96
Species 1 (Tineinae)	2c, 6a, 7a, 8a	25 Mar - 14 Sep 97
<b>Tortricidae</b>		
<i>Bactra macopiana</i>	3b	11 Jul -11 Aug 97
<i>Cydia bracteata</i>	2c	13 Jun 96
<i>Cydia latiferreana</i>	8a	14 Sep 97
<i>Cydia membrosa</i>	1a	8 Jul - 6 Aug 96
<i>Epiblema sosana</i>	1a	30 May 96
<i>Eucosma sandiego</i>	1a, 5a	11-25 Sep 96
<i>Eucosma nr totana</i>	8a, 9a	14-20 Sep 97
<i>Eucosma</i> species 1	9a	20 Sep 97
<i>Eucosma</i> species 2	8a	14 Sep 97
<i>Ofatulena duodecemstriata</i>	1a, 1c	8 Jul - 6 Aug 96
	7a	29 Aug 97
<i>Phaneta</i> species 1	4a	5 Mar 97
* <i>Sonia</i> species	3b	21 Sep 98
Species 1	8b	16 Jun 98
Species 2	1a	13 Jun 96
Species 3	2c	2 Apr 96
<b>Microlepidoptera</b>		
Species 1	6a	10 Sep 98
Species 2	1a	6 Sep 97
<b>Diptera</b>		
<b>Agromyzidae</b>		
<i>Melanagromyza</i> sp.	5c	26 Jun 96
Species 1	3b	6 Jun 96
	8b	16 Jun 98
Species 2	1a, 3b, 6b, 7b,	
	8a, 9a	6 Sep - 5 Oct 97
	9a	23 Nov 97
Species 3	3b	26 Feb 97
<b>Anthomyiidae</b>		
<i>Delia angustiventralis</i>	1a-b, 5a, 5c	11-16 Apr 96
<i>Delia platura</i>	3a-b, 5c	4-18 Apr 96
<i>Hylema cinerella</i>	1a, 2c	16 Apr - 13 Jun 96
<i>Pegomya duplicata</i>	1a	16 Apr - 8 Jul 96
	1a, 2a, 3a-b, 4c,	
	6a, 7a-b, 9a	29 Jan - 20 Oct 97
	6a, 9a	23 Nov - 18 Jun 98
<i>Pegomya finita</i>	3b	9 Oct 96
<i>Orthacheta</i> species	2b, 4a	2-9 May 96
Species 1	7a	7 May 97



Species 2	3b-c 8b	26 Feb - 22 Apr 97 16 Jun - 10 Jul 98
<b>Anthomyzidae</b>		
<i>Anthomyza</i> sp.	3b	6 Jun 96
	3b	26 Feb - 20 Nov 97
Species 1	3b	6 Jun 96
Species 2	3b	20 Nov - 26 Feb 97
<b>Apioceridae</b>		
<i>Apiocera acuticauda</i>	1a	8 Jul 96
	9a	10 Jul 98
<i>Apiocera pearcei</i>	5a	15 May - 26 Jun 96
<i>Rhaphiomidas acton</i>	4a	5 Jul 96
	8a-b, 10b	10-29 Jul 98
<b>Assilidae</b>		
<i>Ablautus basini</i>	1a-b	18 Mar 96
<i>Ablautus californicus</i>	1a	18 Mar 96
<i>Asilus californicus</i>	3b	6 Jun 96
<i>Asilus occidentalis</i>	5a	15 May 96
<i>Cerotainiops willcoxi</i>	1b	8 Jul 96
<i>Cerotainiops</i> n. sp.	7b	29 Aug 97
<i>Coleomyia</i> sp.	9a	25 Mar 97
<i>Comontella fallei</i>	4a	1 Nov 97
<i>Cophura clausa</i>	5a	11 Apr 96
<i>Cophura timberlakei</i>	4b	1 Nov 97
<i>Cophura tunca</i>	6a	5 Oct 97
<i>Cophura vanduzeei</i>	1a	20 Oct 97
<i>Efferia albibarbis</i>	3b	2 Jun 97
<i>Efferia near antiochi</i>	1a-b	25 Sep 96
<i>Efferia benedicti</i>	8a	16 Jul 97
	8a, 10d	10-29 Jul 98
<i>Efferia cana</i>	1a, 3b, 4c, 5a	9 May - 13 Jun 96
	6a	1 May - 18 Jun 98
<i>Efferia candida</i>	1a, 5a	26 Jun - 6 Aug 96
	8a	16 Jul 97
	6a, 8b, 9a	18 Jun - 10 Jul 98
<i>Efferia deserti</i>	6a, 8a	3-13 May 97
<i>Efferia producta</i>	5b	2 May - 26 Jun 96
<i>Efferia</i> species 1	8b	10 Jul 98
<i>Efferia</i> species 2	2a, 4b, 4c	9 May - 13 Jun 96
<i>Heteropogon</i> sp.	9a	20 Sep 97
<i>Lestomyia sabulana</i>	2c, 9a	25 Mar 97
	6a	1 May 98
<i>Mallaphorina frustrata</i>	2a-b	13 Jun - 4 Sep 96
	8a	10 Jul 98
<i>Metapogon tricellus</i>	4b	1 Nov 97
<i>Proctacanthus nearno</i>	1a	30 May 96

<i>Saropogon hyalinus</i>	1a-c, 2a, 3a-c, 4a-b, 5b 8b, 9a, 10b, 10d	30 May - 6 Aug 96 10-29 Jul 98
* <i>Stenopogon ozenae</i>	6a, 9a	18 Jun - 10 Jul 98
* <i>Stenopogon martini</i>	6a, 10c-d	26 May - 29 Jul 98
<i>Stichopogon nr. fragilis</i>	1a	15 Sep 97
<b>Asteiidae</b>		
<i>Astiosoma aridum</i>	1a, 2a 7b	2-30 May 96 7 May 97
<b>Bibionidae</b>		
<i>Bibio alpipennis</i>	1a, 5b	11-16 Apr 96
<i>Dilophus tingi</i>	2c	13 Jun 96
<i>Philia orbata</i>	9a	20 Sep 97
<b>Bombyllidae</b>		
<i>Anthrax irroratus</i>	2b, 4c, 5b 9a	29 Mar - 26 Jun 96 25 Mar 97
* <i>Anthrax varicolor</i>	6a	18 Jun 98
<i>Aphoebantus desertus</i>	1a, 2c, 4a 6a	5 Mar - 8 Apr 97 1 May 98
<i>Aphoebatus marcidus</i>	5a	11 Apr 96
<i>Aphoebantus marginatus</i>	1a, 6b 8b	8 Apr - 13 Jun 97 10 Jul 98
<i>Aphoebantus mus</i>	3b	6 Jun 96
<i>Aphoebantus transitus</i>	4b	5 Mar 97
<i>Aphoebantus species</i>	2b, 4a, 5a-b	9 May - 17 Oct 96
<i>Apolysis druias</i>	1a-c, 3b, 4a, 4c, 5a-c	11 Apr - 25 Sep 96
<i>Apolysis sp. 1</i>	2d, 3b, 7a, 9a 4a-b 1a, 1d, 2d, 7a-b	22 Apr - 20 Sep 97 18 Sep 96 8 Apr - 20 Oct 97
<i>Apolysis sp. 2</i>	2c, 5b, 9a	22 Oct - 25 Mar 98
<i>Bombylius californica</i>	5a 2b 8b	11 Apr 96 29 Mar 96 14 Mar 98
<i>Chrysanthrax pertusus</i>	2a, 4a 6b, 7b 8a-b, 10b, 10d	5-13 Jul 96 13 Jun - 29 Aug 97 10-29 Jul 98
<i>Conophorus fenestratus</i>	2a-b, 5b 9a	29 Mar - 11 Apr 96 25 Mar 97
* <i>Conophorus species</i>	2b	14 Mar 98
<i>Exepacmus species</i>	4a, 5a	9-11 Apr 96
<i>Exoprosa sharonae</i>	5b	11 Sep 96
<i>Geminaria canalis</i>	2a, 4a	2-9 May 96
<i>Geron nigripes</i>	1a-5c	30 May - 1 Nov 96

	1a, 1d, 6a, 7a-b,	
	8a	7 May - 20 Oct 97
	6b, 8a	23 Nov - 10 Jul 98
<i>Hemipenthes eumenes</i> group	1a, 4a, 5a-b	9-16 Apr 96
	1a, 2c, 9a	25 Mar - 8 Apr 97
	6a	1 May 98
<i>Heterostylum robustum</i>	3b, 4a	9 May - 2 Aug 96
	6a	1 May 98
<i>Lepidanthrax inauratus</i>	2a-b, 5a-b	15 May - 4 Sep 96
	6b	13 Jun 97
	6a	18 Jun 98
<i>Lordotus cingulatus</i>	3c, 5a	11 Sep - 9 Oct 96
<i>Lordotus luteolus</i>	1a, 4a, 5a	9 Apr - 25 Sep 96
	9a	25 Mar 97
	8b, 10c	21-26 May 98
<i>Lordotus striatus</i>	2b-c, 3a	9-17 Oct 96
<i>Mythiocomyia antecessor</i>	1a-b, 4a, 5c	26 Jun - 25 Sep 96
	7a-b, 8a	29 Jun - 29 Aug 97
	10d	29 Jul 98
<i>Mythiocomyia armata</i>	5b-c	11 Apr - 22 Oct 96
<i>Mythiocomyia californica</i>	1b, 4a	18-25 Sep 96
<i>Neodiplocampta</i> sp.	3b	2 Aug 96
<i>Oligodranes trochilus</i>	1a, 2a-c, 4a-c,	
	5a-b	29 Mar - 1 Nov 96
	4a, 9a-b	5-25 Mar 97
<i>Pantarbes erinos</i>	5a	15 May 96
	6b	18 Jun 98
<i>Pantarbes</i> sp. 1	2c, 4a, 9a	5-25 Mar 97
* <i>Paracosmus similis</i>	6a	18 Jun 98
<i>Paravilla californica</i>	4c	9 May 96
<i>Paravilla mercedis</i>	2a-b	13 Jun 96
<i>Paravilla syrtis</i>	2a-b, 4a, 4c	2 May - 18 Sep 96
	6a-b	3 May 97
	6a, 8b	16-18 Jun 98
<i>Poecilanthrax californicus</i>	2a, 2c, 3a, 3c	9-17 Oct 96
	6b, 7a	5-12 Oct 97
<i>Poecilanthrax willistoni</i>	2b, 3a-c, 5a	3-22 Oct 96
<i>Toxophora virgata</i>	1a, 3b, 3c	6 Jun - 11 Jul 96
<i>Villa agrippina</i>	1a-b, 2a, 3a-c,	
	4c, 5a, 5c	2 May - 9 Oct 96
	1b, 3b-c, 8a	22 Apr - 6 Sep 97
	6a, 8a-b, 10a	18 Jun - 10 Jul 98
<i>Villa andrewsi</i>	4c	9 Apr 96
	9a	25 Mar 97
<i>Villa arenosa</i>	2a	13 Jun 96
	3b	2 Jun 97
<i>Villa caprea</i>	1a-b	25 Sep 96
* <i>Villa crocina</i>	8b	19 Aug 98
<i>Villa lateralis</i>	4a, 5a-c	9 May - 11 Sep 96

<i>Villa pallida</i>	1c, 2a	2-30 May 96
	6a	1 May 98
<i>Villa species 1</i>	1a	25 Sep 96
	6a	18 Jun 98
* <i>Villa species 2</i>	6a, 8b	18 Jun -10 Jul 98
<i>Villa species 3</i>	7a	29 Jun 97
Species 1	1a	6 Sep 97
Species 2	8a	13 May 97
Species 3	4a	5 Mar 97
<b>Calliphoridae</b>		
<i>Bufo lucilia silvarum</i>	3b	11 Jul 96
	3b	11 Apr 97
	9a	23 Nov 97
<i>Calliphora terrae-novae</i>	3a, 5b	11-18 Apr 96
	5b	19 Feb 97
<i>Pollenia rudis</i>	3b	18 Apr 96
	3b, 3d, 8a	11 Apr - 21 Sep 97
	9a	23 Nov 97
Species 1	3b	6 Jun 96
Species 2	3b	11 Jul 96
Species 3	7a, 8a	29 Jun - 12 Oct 97
Species 4	8a	16 Jul 97
<b>Cecidomyiidae</b>		
<i>Asphondylia</i> sp. 1	2c, 4a, 5a	13 Jun - 18 Sep 96
	6a, 7a, 8a, 9a	7 May - 14 Sep 97
	6a, 8b	16 Jun - 19 Aug 98
<i>Asphondylia</i> sp. 2	1a, 2c	16 Apr - 17 Oct 96
	1a, 2a, 3b, 4a,	
	7a, 8a, 9a	29 Jan - 21 Sep 97
	6a, 8b	16 Jun - 29 Jul 98
Species 1	1c, 3c	4 Apr - 8 Jul 96
	2d, 3b, 6a, 7a,	
	8a, 9a	29 Aug - 5 Oct 97
Species 2	1a, 1d	6 Sep - 20 Oct 97
	6a, 9a	23 Nov 97
<b>Ceratopoginidae</b>		
<i>Culicoides</i> near <i>copiosus</i>	3a	4 Apr - 6 Jun 96
<i>Culicoides</i> sp. 1	1a, 7a	7 May - 6 Sep 97
<i>Dasynolea</i> sp.	3a	4 Apr 96
<i>Forcipomyia brevipennis</i>	5c	11 Apr 96
	1a, 3a, 8a, 9a	14 Sep - 20 Nov 97
	6a, 8b	23 Nov - 10 Sep 98
<i>Leptoconops</i> sp. 1	3b-c	4 Apr - 6 Jun 96
<i>Leptoconops</i> sp. 2	2b	29 Mar 96
<i>Rhynchohelea</i> sp.	3b	6 Jun 96
Species 1	7b	12 Oct 97

**Chaemyiidae**

<i>Leucopis</i> species 1	1a, 1c	30 May - 8 Jul 96
	2c	25 Mar 98
<i>Leucopis</i> species 2	1c	8 Jul 96
<i>Leucopis</i> species 3	5c	26 Jun 96
<i>Leucopis</i> species 4	5a, 5c	11 Apr 96
<i>Leucopis</i> species 5	2a	2 May 96
* <i>Leucopis</i> species 6	6a, 9a	23 Nov 98

**Chironomidae**

Species 1	1a, 2c, 3b	30 May - 13 un 96
	1a, 3a-b, 3d,	
	7a	8 Apr - 21 Sep 97
Species 2	1a, 3a-c	4 Apr - 6 Jun 96
Species 3	1a, 3a-b	18 Apr - 6 Jun 96
	3b, 9a	20 Sep - 20 Nov 97
Species 4	1a	16 Apr 96
	1a, 3d	8 Apr - 20 Oct 97
Species 5	2c, 3b	18 Apr - 13 Jun 96
Species 6	1a, 3a-b	18 Mar - 6 Jun 96
Species 7	1a, 3a-b	16 Apr - 6 Jun 96
Species 8	3a-b	6 Jun 96
	1a	6 Sep - 20 Oct 97
Species 9	1a, 3b	11 Apr - 6 Sep 97

**Chloropidae**

<i>Biorbitella hesperia</i>	3a	18 Apr - 6 Jun 96
<i>Diplotoxa unicolor</i>	3a	11 Jul 96
<i>Hippelates</i> species	1a, 2a, 3a-c,	
	4a, 4c, 5c	4 Apr - 22 Oct 96
<i>Ocella punctifrons</i>	1a, 3a	30 May - 6 Jun 96
	2d, 6a, 7a-b	2 May - 29 Aug 97
<i>Ocella</i> species	1a, 4a-c	9 May - 8 Jul 96
<i>Siphonella</i> species	1c, 2c, 3a-b,	
	5c	4 Apr - 22 Oct 96
	3b	11 Apr - 11 Aug 97
<i>Thaumstomya rubida</i>	1a, 1c	30 May 96
	1a, 2d	6-14 Sep 97
Species 1	2a, 3a-b, 5a-b	2 May - 22 Oct 96
Species 2	1c, 3c	4 Apr - 30 May 96
Species 3	3b	4 Apr 96
Species 4	1a, 3a-b, 7a-b,	
	8a	26 Feb - 20 Nov 97
Species 5	3b	2 Jun 97
Species 6	1a, 3b	6-21 Sep 97
Species 7	1a	6 Sep 97
Species 8	6a, 7a	2-7 May 97
Species 9	1a, 2d, 7a	8 Apr - 13 May 97
Species 10	1a	8 Apr 97

<b>Chyromiidae</b>		
<i>Gymnochiromyia</i> sp.	1a	16 Apr 96
<b>Conopidae</b>		
<i>Physocephala texana</i>	3a-b	6 Jun - 3 Oct 96
	3b	11 Apr - 11 Apr 97
<i>Thecophora propinqua</i> 1a		8 Jul 96
<i>Zodion fulvifrons</i>	1a, 2a, 5a	2 May - 22 Oct 96
<b>Culicidae</b>		
<i>Aedes varipalpus</i>	5a	11 Sep 96
	1a, 3a-b	11 Apr - 20 Oct 97
	6a	23 Nov 97
<i>Culiseta inomata</i>	3b	6 Jun 96
	6a, 9a	20 Sep - 5 Oct 97
	6a, 9a	23 Nov 97
<i>Culex peus</i>	3b	6 Jun 96
	3a-b	11 Apr - 21 Sep 97
<b>Dolichopodidae</b>		
<i>Dolichopus consanguineus</i>	3a-b	18 Apr - 9 Oct 96
	3a-b, 6a	11 Apr - 5 Oct 97
<i>Dolichopus</i> sp.	3b	9 Oct 96
<i>Hydrophorus eldoradensis</i>	1a, 3b, 5c	4 Apr - 30 May 96
	3a	20 Nov 97
<i>Hydrophorus innotatus</i>	2, 3a-b	4 Apr - 17 Oct 96
<i>Medetera</i> species	1a, 3b	16 Apr - 6 Jun 96
	1a, 7a	6 Sep - 12 Oct 97
Species 1	3b	20 Nov 96
	1a	6 Sep 97
<b>Drosophilidae</b>		
Species 1	1a, 6a, 9a	6 Sep - 5 Oct 97
*Species 2	8b	16 Jun 98
Species 3	9a	23 Nov 97
<b>Empidae</b>		
<i>Drapetis</i> sp.	1a	25 Sep 96
<i>Platypalpus</i> sp.	3a	4 Apr 96
Species 1	3a	26 Feb - 20 Nov 97
<b>Ephydriidae</b>		
<i>Ephydra halophila</i>	2c, 3a-b, 4a	4 Apr - 17 Oct 96
	3a-b	21 Sep - 20 Nov 97
<i>Mosillus tibialis</i>	1a-b, 2b, 3a-c,	
	5c	4 Apr - 6 Aug 96
	1a-b, 1d, 3a-b,	
	6a, 7a	26 Feb - 20 Nov 97
<i>Parydra</i> sp.	3a-b	4-18 Apr 96

- <i>Psilopa olga</i>	3a	4 Apr - 11 Jul 96
	3a	26 Feb 97
<i>Ptilomyia pleuriseta</i>	3a-b	18 Apr - 11 Jul 96
<i>Scatella paludum</i>	3a-c	4 Apr - 6 Jun 96
<i>Scatella stagnalis</i>	3a	18 Apr 96
Species 1	3b	20 Nov 96
	6a	22 Aug 97
	8b	10 Jul 98
Species 2	1a	18 Mar 96
Species 3	2c	13 Jun - 4 Sep 96
Species 4	1a	25 Sep 96
	6a	10 Sep 98
<b>Heleomyzidae</b>		
<i>Pseudoleria</i> species	1a, 2c	2-16 Apr 96
	2a, 3b, 9a	29 Jan - 25 Mar 97
	6a, 9a	23 Nov 97
Species 1	4c, 9a	5-25 Mar 97
Species 2	1a	20 Oct 97
<b>Longchopteridae</b>		
Species 1	8b	16 Jun 98
<b>Milichiidae</b>		
<i>Hemeromyia</i> sp.	3b	18 Apr 96
<i>Leptometopa latipes</i>	1b-c, 5c	16 Apr - 30 May 96
<i>Milichiella</i> sp. 1	2b, 3b, 5b	29 Mar - 6 Jun 96
<i>Milichiella</i> sp. 2	1c, 2a, 3a-c,	
	4a-b, 5a-c	29 Mar - 22 Oct 96
	1a, 1d, 2d, 3a-b,	
	6a, 7a-b, 9a	26 Feb - 20 Oct 97
	6a	23 Nov - 1 May 98
<b>Muscidae</b>		
<i>Limnophora narona</i>	3b	2 Aug 96
	7b	12 Oct 97
<i>Lispe</i> species	1a, 2c, 3a-b	2 Apr - 9 Oct 96
	1a, 3a-b	2 Jun - 20 Oct 97
	6a, 10d	23 Nov - 29 Jul 98
Species 1	5c	15 May 96
Species 2	1a	8 Jul 96
Species 3	3b	8 Apr 96
Species 4	3a-b	4-18 Apr 96
	1a	20 Oct 97
	2b	14 Mar 98
Species 5	1c, 2a	8 Jul - 17 Oct 96
	1a, 3a, 8a, 9a	6-21 Sep 97
Species 6	3a, 3c, 5b-c	18 Apr - 22 Oct 96
Species 7	3a-b, 5a, 5c	4 Apr - 22 Oct 96

	1a, 3b	6 Sep - 20 Nov 97
Species 8	3b	18 Apr 96 21 Sep 97
<b>Mycetophilidae</b>		
<i>Docosia</i> sp.	5c	11 Apr 96
Species 1	1a	20 Oct 97
*Species 2	6a	23 Nov 97
<b>Mydidae</b>		
<i>Pseudonomo neuro</i>	7b	29 Aug 97
* <i>Pseudonomoneura californica</i>	10d	29 Jul 98
<b>Otitidae</b>		
<i>Euxesta</i> sp. 1	3b	2 Aug 96
	3b	11 Apr 97
<i>Euxesta</i> sp. 2	3a-b	4 Apr 96
	3b	2 Jun 97
<i>Euxesta</i> sp. 3	3b	2 Aug 96
<i>Euxesta</i> sp. 4	5c	11 Apr 96
	3b, 7b, 9a	25 Mar - 12 Oct 97
<i>Meliera similis</i>	3b	11 Jul - 9 Oct 96
	3b	2 Jun 97
<i>Physiphora demandata</i>	1a, 5a	8 Jul - 11 Sep 96
	3b	22 Apr 97
<b>Phoridae</b>		
*Species 1	6a, 8a	23 Nov 97
<b>Richardiidae</b>		
Species 1	7b	12 Oct 97
<b>Sarcophagidae</b>		
<i>Blaesoxipha plinthopyga</i>	1b, 2a-b, 3c, 4b-c, 5a-b	15 May - 17 Oct 96
	1a, 6a, 7a-b, 8a	8 Apr - 5 Oct 97
	6a, 10d	1 May - 29 Jul 98
<i>Blaesoxipha. omani</i>	1a, 4a, 5a-b	9 May - 11 Sep 96
	1a, 7a, 8a, 9a	2 Aug - 20 Sep 97
<i>Eumachronychia persolla</i>	3c, 5b	6-26 Jun 96
<i>Senotainia flvicornis</i>	3b	2 Aug 96
Species 1	3b, 4a	9 May - 2 Aug 96
Species 2	1a	8 Jul 96
<b>Scatopsidae</b>		
<i>Coboldia fuscipes</i>	3a-b	4 Apr - 2 Aug 96
	3a-b	22 Apr - 20 Nov 97
Species 1	3b	6 Jun 96



<b>Scenopinidae</b>		
<i>Belosta</i> sp.	5a	11 Apr 96
	7b	29 Aug 97
<i>Metatrichia bulbosa</i>	1a, 2a, 3b-c, 4a-b, 5b	9 May - 18 Sep 96
	2d, 6a, 7a-b	2 May - 29 Aug 97
	6a	18 Jun - 10 Sep 98
Species 1	2d, 8a	13 May - 16 Jul 97
<b>Sciomyzidae</b>		
<i>Pherbella vitalis</i>	3b	9 Oct 96
<b>Sepsidae</b>		
<i>Sepsis neocynipsea</i>	3b	11 Jul 96
	9a	20 Sep 97
<b>Simuliidae</b>		
<i>Simulium vittatum</i>	3b	14 Apr 96
Species 1	7a	7 May 97
<b>Sphaeroceridae</b>		
<i>Copromyza equina</i>	2c	13 Jun 96
	6a	3 May 97
<i>Leptocera limosa</i>	2c, 3a-b	4 Apr - 11 Jul 96
	3a-b, 6a, 9a	26 Feb - 20 Nov 97
	6a, 8b	16 Jun - 10 Sep 98
<b>Stratiomididae</b>		
<i>Dieuryneura stigma</i>	1a	8 Jul 96
<i>Nemotelus arator</i>	3b	4 Apr - 2 Aug 96
<i>Odontomyia alticola</i>	1a	25 Sep 96
<i>Odontomyia arcusta</i>	1a, 3b	25 Sep - 9 Oct 96
<b>Syrphidae</b>		
<i>Allograpta exotica</i>	3b, 4a	18 Sep - 9 Oct 96
<i>Ceriana</i> species	1a, 3b	30 May - 2 Aug 96
	1a	8 Apr 97
<i>Eristalis alhambra</i>	3b	11 Aug 97
<i>Eristalis latifrons</i>	1a, 3b, 4b 5a	16 Apr - 8 Nov 96
	3a-b	11 Aug - 21 Sep 97
	8a-b, 10c	26 May - 16 Jun 98
<i>Eristalis tenax</i>	1a	16 Apr 96
	3b	22 Apr - 11 Aug 97
	8b-c, 10c	26 May - 16 Jun 98
<i>Eupeodes volucris</i>	5c	11 Apr 96
	1a, 3a-b, 4a	5 Mar - 21 Sep 97
	2b, 6a, 8a-c,	
	10c	14 Mar - 26 May 98
<i>Helophilus bilineatis</i>	3b	4 Apr 96

<i>Mesograpta marginata</i>	5a	22 Oct 96
	1a	6 Sep 97
<i>Platycheirus stegnus</i>	3c, 5b	4-11 Apr 96
	1a	8 Apr 97
<i>Polydontomyia curvipes</i>	3b	11 Aug 97
<i>Syrirta pipiens</i>	3b	11 Jul 96
	3b, 3d	11 Apr - 21 Sep 97
*Species 1	6a	23 Nov 97

#### Tabanidae

* <i>Apatolestes comastes</i>	6a	18 Jun 98
<i>Chrysopa discalis</i>	3a-b	4 Apr - 9 Oct 96
	3b	11 Apr - 11 Aug 97
<i>Silvius abdominalis</i>	3b	6 Jun 96
<i>Tabanus punctifer</i>	3b	6 Jun - 11 Jul 96
	1a, 3a	6-21 Sep 97

#### Tachinidae

<i>Angiorhina robusta</i>	3b	6 Jun 96
<i>Cylindromyia armata</i>	4b	9 May 96
<i>Deopalpus contiguus</i>	4b	9 Apr 96
<i>Euphasiopteryx ochracea</i>	1a	6 Aug - 25 Sep 96
<i>Gymnosoma fuliginosum</i>	1a, 3a-b, 3c,	
	4a, 5b	18 Mar - 9 May 96
	6a	18 Jun 98
<i>Micrachaetina species</i>	4c	9 May 96
	1a, 4a, 6a, 7a,	
	8a	5 Mar - 5 Oct 97
	6b, 8a, 10c	21 May - 19 Jun 98
<i>Paradidyma species</i>	1a, 2a, 3c	4 Apr - 8 Jul 96
<i>Peleteria malleola</i>	1a, 3c, 5a	4-16 Apr 96
	1a, 5a, 9a	19 Feb - 8 Apr 97
	2b, 10d	14 Mar - 29 Jul 98
<i>Phasia aldrichii</i>	2b, 4a, 5a-c	29 Mar - 22 Oct 96
	6a, 8c	16-18 Jun 98
<i>Phasia species</i>	4a, 5b	9-11 Apr 96
<i>Trichopoda pennipes</i>	2a	13 Jun 96
Species 1	6c, 8a	2-13 May 97
Species 2	1a, 2c	13 Jun - 8 Jul 96
	3b, 4a, 7a	5 Mar - 12 Oct 97
	6b, 8b-c 9a,	
	10a	16 Jun -29 Jul 98
*Species 3	8b	16 Jun - 10 Jul 98
Species 4	1a, 3b	22 Apr - 6 Sep 97
	6a, 9a, 10d	18 Jun - 29 Jul 98
Species 5	1a	6 Jun 95
	6b	18 Jun 98
Species 6	9a	25 Mar 97
Species 7	3b	11 Apr - 11 Aug 97

*Species 8	8b	14 Mar 98
Species 9	1a	25 Sep 96
Species 10	3b	6 Jun 96
Species 11	1a, 2c	13 Jun - 8 Jul 96
Species 12	1a	8 Jul 96
*Species 13	6a	23 Nov 97
<b>Tenthinidae</b>		
<i>Pelomyia</i> sp.	3b	4-18 Apr 96
<i>Pelomyiella</i> sp.	1a, 3b-c	4-18 Apr 96
<b>Tephritidae</b>		
<i>Dioxya picciola</i>	4a	18 Sep 96
<i>Euarestoides acutangulus</i>	1a, 2b-c, 3c, 4a, 5b-c	29 Mar - 9 May 96
<i>Neaspilota brunneostigmata</i>	1b, 3c, 4a 8b-c	9 May - 24 Sep 96 16 Jun 98
<i>Paroxyma murina</i>	4a	9 May 96
<i>Prececidochares minuta</i>	5a	11 Apr 96
<i>Trupanea jonesi</i>	5a-b 6a	11 Apr 96 2 May 97
Species 1	1a 8c	6 Sep 97 16 Jun 98
Species 2	1a	6 Sep 97
Species 3	1a, 3a, 9a	6-21 Sep 97
Species 4	1a, 9a	6-27 Sep 97
<b>Therevidae</b>		
<i>Pherocera mojavensis</i>	1b, 2a, 3c	30 May - 13 Jun 96
<i>Thereva</i> sp. 1	1b 1d, 3a, 4b	16 Apr 96 5 Mar - 21 Sep 97
<i>Thereva</i> sp. 2	1b, 5a, 5c	11-16 Apr 96
<i>Thereva</i> sp. 3	1a-b, 5c 1d, 7b	11 Apr - 6 Aug 96 8 Apr - 7 May 97
<i>Thereva</i> sp. 4	7a	7 May 97
<i>Thereva</i> sp. 5	8a	13 May - 14 Sep 97
<b>Tipulidae</b>		
<i>Dactylolabis vestigipennis</i>	2c	29 Jan 97
<i>Erioptera cana</i>	3b	26 Feb 97
<i>Limnophila</i> sp.	3b 3b	6 Jun 96 2 Jun 97
<i>Tipula</i> species 1	1b 1a, 2c, 7b	16 Apr 96 25 Mar - 7 May 97
<i>Tipula</i> species 2	2c 1a, 2c	2 Apr 96 25 Mar - 8 Apr 97
<i>Tipula</i> species 3	2c 6a	25 Mar 97 1 May - 18 Jun 98
<i>Tipula</i> species 4	1b	8 Apr 97

* <i>Tipula</i> species 5	8b	16 Jun -10 Jul 98
Species 1	3a	26 Feb 97
Species 2	1a	6 Sep 97

### **Trixoscelidae**

<i>Trixoscelis frontalis</i>	1a, 1c, 3b-c, 4a, 4c, 5a-c	4 Apr - 6 Jun 96
	9a	25 Mar 97
Species 1	1a, 2c, 4c, 9a	5 Mar - 8 Apr 97

## **Hymenoptera**

### **Andrenidae**

<i>Andrena astragali</i>	1a, 3b, 4a, 5b	18 Mar - 9 May 96
<i>Andrena auricoma</i>	1a, 5b	30 May - 11 Sep 96
<i>Andrena blaisdelli</i>	4a-b	5 Mar 97
	8c	21 May 98
<i>Andrena bipunctata</i>	5b	22 Oct 96
* <i>Andrena candida</i>	3b	14 Mar 98
<i>Andrena cleodora</i>	1d, 4a	9-18 Apr 96
<i>Andrena dissimulus</i>	4a	9 Apr 96
<i>Andrena levipes</i>	2b	29 Mar 96
<i>Andrena palpalis</i>	4a	5 Mar 97
<i>Andrena prunorum</i>	1a, 4a-b	9 Apr - 9 May 96
<i>Andrena subchalybea</i>	1a	16 Apr 96
<i>Andrena submoesta</i>	2b, 3c, 4a	29 Mar - 9 Apr 96
<i>Andrena</i> species 1	2b	2 May 96
<i>Andrena</i> species 2	4a, 9a	5-25 Mar 97
* <i>Andrena</i> species 3	2b	14 Mar 98
<i>Nomadopsis puellae</i>	1a	16 Apr 96
<i>Nomadopsis scutellaris</i>	3b	6 Jun - 3 Oct 96
	3b	11 Apr 97
* <i>Nomadopsis</i> species 1	6a	1 May 98
* <i>Nomadopsis</i> species 2	3b	11 Apr 98
<i>Perdita claypolei</i>	1a	16 Apr 96
	1a, 3b	8 Apr - 11 Aug 97
<i>Perdita chrysomthamni</i>	2b	17 Oct 96
<i>Perdita intersecta</i>	1a-b, 2a, 3a-b, 4c, 5a	2 May - 22 Oct 96
<i>Perdita nigrella</i>	1a, 3a, 5a	11 Apr - 6 Jun 96
<i>Perdita</i> species	1a, 1c	30 May 96
	2c, 4b	5-25 Mar 97
	7b	7 May 97
* <i>Perdita</i> species 2	10c	26 May 98
<i>Perdita</i> species 3	2c, 4c	5-25 Mar 97
<i>Perdita</i> species 4	6a	2 May 97
<i>Perdita</i> species 5	1d	20 Oct 97

- <i>Perdita</i> species 6	4a	5 Mar 97
Species 1	4b	9 Apr 96
Species 2	7b	7 May 97
Species 3	4a, 5a	9-11 Apr 96
Species 4	4a	5 Mar 97
Species 5	4a-b, 9b	5 Mar - 13 May 97
Species 6	4b	5 Mar 97
Species 7	3b	11 Apr 97

### **Anthophoridae**

<i>Anthophora urbana</i>	2a, 3a-b	6-13 Jun 96
	6a	5 Oct 97
<i>Anthophora cockerelli</i>	1a, 5a	26 Jun - 25 Sep 96
	8b	10 Jul 98
* <i>Anthophora curta</i>	8b	19 Aug 98
<i>Anthophora flavocincta</i>	3a-c	6 Jun - 2 Aug 96
<i>Anthophora hololeuca</i>	5b-c	11 Sep 96
<i>Anthophora petrophila</i>	2c	25 Mar 97
<i>Anthophora porterae</i>	5a	11 Apr 96
<i>Anthophora</i> Species	7b	29 Jun 97
<i>Centris hoffmanseggiae</i>	2a, 4b-c, 5a	9 Apr - 15 May 96
	6a, 7b	2-7 May 98
<i>Diadasia australis</i>	2a, 3b-c	6 Jun - 2 Aug 96
* <i>Diadasia diminuta</i>	8b	16 Jun 98
<i>Diadasia enavata</i>	1a, 2a	13 Jun - 25 Sep 96
<i>Diadasia laticauda</i>	1a, 3a-b	11 Jul - 25 Sep 96
<i>Diadasia tuberculifrons</i>	1a, 7b	7 May - 6 Sep 97
<i>Melissodes tessellata</i>	1a, 3a-c	6 Jun - 9 Oct 96
<i>Melissodes appresa</i>	1a-b, 2c, 3b	2 Aug - 17 Oct 96
	1d	20 Oct 97
	9a, 10c-d	26 May - 29 Jul 98
	3b	11 Aug 97
<i>Melissodes bimatrix</i>	2b, 3a-c	2 May - 9 Oct 96
	1d	20 Oct 97
	10d	29 Jul 98
<i>Melissodes</i> species	3b	11 Apr 97
<i>Nomada (Nomada)</i> species	4a-b	9 Apr 96
	9a	25 Mar 97
<i>Ptilothrix near bombiformis</i>	2c	17 Oct 96
<i>Synhalonia primavera</i>	4a	5 Mar 97
	10c	26 May 98
<i>Tetralonia primiveris</i>	4a, 5b	9-11 Apr 96
* <i>Tetraloniella eriocarpi</i>	8b, 9a	10 Jul 98
<i>Triepeolus ancoratus</i>	1b, 2a, 5a-b	2 May - 22 Oct 96
	7b	7 May 97
	6a	18 Jun 98
<i>Xeromelecta californica</i>	5a	22 Oct 96
Species 1	5b-c	11 Sep 96
Species 2	3c	6 Jun 96

Species 3	5b	11 Apr 96
Species 3	6a	7 May 97
Species 4	4a, 9a	5-25 Mar 97
<b>Apidae</b>		
<i>Apis mellifera</i>	1a, 2a-b, 5a-b	29 Mar - 8 Nov 96
<i>Bombus crotchii</i>	2c	13 Jun 96
	6a, 8a, 8c, 9a	21 May - 10 Jul 98
<i>*Bombus vosnemenshii</i>	8a, 8c	16 Jun - 10 Jul 98
<b>Bethylidae</b>		
<i>Epyris</i> species	1a, 3b, 5a	8 Jul - 11 Sep 96
	3b, 3d, 5a, 7a,	
	8a	29 Jun - 20 Nov 97
	6a, 8b, 10d	10 Jul - 10 Sep 98
Species 1	2a	2 May 96
	6a, 7a, 8a	13 May - 29 Aug 97
<b>Braconidae</b>		
<i>Agathis</i> species 1	3b, 4c, 5b-c	4 Apr - 9 May 96
	8b-c	16 Jun - 10 Jul 98
<i>Agathis</i> species 2	1c	8 Jul 96
<i>Agathis</i> species 3	1c, 3c, 5a	11 Apr - 9 Oct 96
<i>Agathis</i> species 4	5b	11 Apr 96
<i>Apanteles</i> species 1	1c, 2a, 4b, 5a,	
	5c	11 Apr - 22 Oct 96
<i>Apanteles</i> species 2	5a	11 Apr 96
<i>Bracon</i> species 1	1c, 5b-c	11 Apr - 30 May 96
<i>Bracon</i> species 2	1a, 1c, 2c, 5a,	
	5c	11 Apr - 4 Sep 96
	6a, 9a	18 Jun - 10 Jul 98
<i>Bracon</i> species 3	1b	8 Jul 96
<i>Bracon</i> species 4	1a-b, 2c	11 Apr - 8 Jul 96
	8b	16 Jun - 19 Aug 98
<i>Bracon</i> species 5	2a	2 May 96
	9a	10 Jul 98
<i>Bracon</i> species 6	5c	26 Jun 96
<i>Chelonus</i> species	5a	11 Apr 96
	6a	18 Jun 98
<i>Cheloninae</i> species	1c	30 May 96
	7a	12 Oct 97
<i>Microgaster</i> species	2c	17 Oct 96
<i>Microplitis</i> species	5c	11 Apr 96
Species 1	5a-c	11 Apr 96
Species 2	2c, 2d, 3d,	
	7a-b	25 Mar - 21 Sep 97
Species 3	1a, 7a-b	8 Apr - 7 May 97
Species 4	1d	20 Oct 97
Species 5	4a	9 May 96

Species 6	2c	25 Mar 97
	6a, 9a	23 Nov 97
Species 7	4c	9 May 96
	6a	2 May 97
Species 8	1a	8 Apr 97
Species 9	1a, 7a	29 Aug - 20 Oct 97
	6b	18 Jun 98
Species 10	1d	20 Oct 97
Species 11	2a	29 Jan 97
Species 12	3b	11 Apr 97
Species 13	8a	14 Sep 97
Species 14	4c	5 Mar 97

### Chalcididae

<i>Haltichella</i> species 1	1a, 2a, 3a, 5b	18 Mar - 26 Jun 96
<i>Haltichella</i> species 2	6a	2 May 97
<i>Hockeria</i> species	5b	11 Sep 96
	8a	13 May 97
Species 1	5c	11 Apr 96
Species 2	3b	11 Jul 96
Species 3	1c	30 May 96
Species 4	5b	15 May 96
Species 6	6a	2 May 97
*Species 7	6a	18 Jun 98
*Species 8	6a	18 Jun 98

### Chrysididae

<i>Chrysis australis</i>	3a	6 Jun 96
	6b	18 Jun 98
<i>Chrysis fuscipennis</i>	3b	11 Jul 96
	3a	21 Sep 97
<i>Hedychridium boharti</i>	5b	15 May 96
<i>Hedychridium fletcheri</i>	2c, 9a	25 Mar 97
<i>Parnopes edwardsii</i>	3a-b	6 Jun - 3 Oct 96
* <i>Parnopsis</i> species	10b	29 Jul 98
<i>Pseudolopyga taylori</i>	1b	25 Sep 96
<i>Pseudomalus</i> sp.	3d	21 Sep 97

### Colletidae

<i>Colletes californica</i>	9a	25 Mar 97
<i>Colletes clypeoentens</i>	1a, 1c, 2c,	
	5a-b	15 May - 22 Oct 96
<i>Colletes louisae</i>	1a, 2b, 4a	2 May - 8 Nov 96
<i>Colletes salicicola</i>	1a	8 Apr 97
<i>Colletes tectiventris</i>	1a	6 Sep 97
<i>Colletes</i> species 1	2c, 5a-b	15 May - 22 Oct 96
<i>Colletes</i> species 2	4a	9 May 96
<i>Colletes</i> species 3	1a	30 May 96
<i>Colletes</i> species 4	1a-b, 5a, 5c	11-25 Sep 96

<i>Colletes</i> species 5	1a	25 Sep 96
<i>Colletes</i> species 6	1a-b, 2c, 5a-b	11 Sep - 17 Oct 96
<i>Colletes</i> species 7	1a, 1c, 2a, 4a-b, 5b	9 Apr - 30 May 96
<i>Hylaeus episcopalis</i>	5b	15 May 96
	2c, 7a	7-13 May 97
<i>Hylaeus mesillae</i>	2b, 3b	6 Jun - 11 Jul 96
Species 1	7a, 9b	7-13 May 97
<b>Cynipidae</b>		
Species 1	5a	11 Apr 96
Species 2	3b	4 Apr 96
*Species 3	6a	23 Nov 98
<b>Encyrtidae</b>		
Species 1	1a, 1c, 2a, 5a-c	18 Mar - 22 Oct 96
Species 2	1a, 2b, 4a	6 Aug - 1 Nov 96
Species 3	2a	17 Oct 96
Species 4	1c, 4b, 5b-c 6a, 7b, 8a	9 May - 22 Oct 96 7 May - 12 Oct 97
Species 5	7a, 8a	29 Jun - 16 Jul 97
Species 6	8a	14 Sep 97
Species 7	7a	7 May 97
Species 8	6a, 7b	29 Aug - 5 Oct 97
Species 9	1d	8 Apr 97
Species 10	6a	22 Aug 97
<b>Eulophidae</b>		
<i>Aprostocetus</i> species 1	2b, 4b 4a, 6a, 7b, 8a, 9a	13 Jun - 17 Oct 96 25 Mar - 5 Oct 97
<i>Aprostocetus</i> species 2	2a, 2c, 3b, 4a, 4c, 5a-b 8a, 9a 9a	11 Apr - 17 Oct 96 16 Jul - 20 Sep 97 1 Jul 98
<i>Cirrospilus</i> species 1	3a	9 Oct 96
<i>Diglyphusia</i> species	3a	11 Jul 96
Eulophinae species	1a	18 Mar 96
Entedoninae species 1	1a	8 Jul 96
Entedoninae species 2	5a	11 Apr 96
<i>Eprhopalotus</i> species	1a, 5b	18 Mar - 22 Oct 96
<i>Sympiesis</i> species	3c	4 Apr 96
<i>Zagrammosoma americanum</i>	7a	7 May 97
<i>Zagrammosoma</i> species	1c	30 May 96
Species 1	1a, 3b, 7b, 9a	8 Apr - 20 Sep 97



**Eupelmidae**

Species 1	4c	9 May 96
	2d, 6a	14 Sep - 5 Oct 97
Species 2	1b	25 Sep 96
	7a	7 May 97

**Eurytomidae**

<i>Eurytoma</i> complex	1a-b, 2a, 2c, 4c, 5a-c	11 Apr - 22 Oct 96
	1a-b, 3b, 7a-b, 8a	22 Apr - 20 Oct 97
	9a, 10d	10-29 Jul 98
Non <i>Eurytoma</i> complex	5a	11 Apr 96
<i>Rileyia cecidomyiae</i>	1b, 3b, 5b	4 Apr - 25 Sep 96
<i>Rileyia hegeli</i>	4a	18 Sep 96
<i>Rileyia mellea</i>	5b	11 Apr 96
<i>Rileyia tequaris</i>	2a, 5a-b	11 Apr - 22 Oct 96
<i>Rileyia</i> sp.	1a, 6a, 7b, 8a, 9a	8 Apr - 20 Sep 97

**Formicidae**

<i>Camponotus semitestaceus</i>	5a	15 May 96
	2a, 2c, 3b	29 Jan - 20 Nov 97
<i>Crematogaster californica</i>	6b, 8a	14 Sep - 5 Oct 97
* <i>Crematogaster larreae</i>	6a	23 Nov 98
<i>Crematogaster mormonum</i>	1b	8 Nov 96
	6a 8a	13 May - 5 Oct 97
<i>Dorymyrmex bicolor</i>	1a, 1c	18 Mar - 6 Aug 96
	1a	12 Feb - 12 Oct 97
<i>Dorymyrmex pyramicus</i>	1a	8 Nov 96
<i>Formica pilicornis</i>	1a, 3b, 5c	4 Apr - 22 Oct 96
	1a, 3a, 3d, 5c	19 Feb - 21 Sep 97
<i>Formica perpilosa</i>	3b	4 Apr - 3 Oct 96
	3b	26 Feb 97
<i>Formica subpolita</i>	3d	21 Sep 97
<i>Iridomyrmex pruinosus</i>	1d, 3a-b, 3d, 6a, 8a	8 Apr - 5 Oct 97
	6a, 9a	23 Nov 98
<i>Lasius neoniger</i>	1a, 3b, 5a	4 Apr - 30 May 96
<i>Leptothorax rugatulus</i>	1a	12 Feb 97
<i>Liometopum occidentale</i>	1a, 3b	11 Jul - 8 Nov 96
<i>Messor pergandei</i>	2a-c, 3c, 4a-c, 4a	1 Jan - 31 Dec 96
	4c, 6a-b	22 Aug - 5 Oct 97
	6a	23 Nov 97
<i>Monomorium minimum</i>	1a, 4c	12 Feb - 5 Mar 97
<i>Myrmecocystus creightoni</i>	5a-b	11 Apr 96
<i>Myrmecocystus mexicanus</i>	4a	18 Sep - 1 Nov 96
	6a, 7a, 8a	13 Jun - 5 Oct 97

	6a	23 Nov 97
<i>Myrmecocystus mimicus</i>	1a-c, 2b, 4a, 4c, 5a	18 Mar - 8 Nov 96
	2a, 2c, 6a, 7a, 9a	29 Jan - 22 May 97
	9a	23 Nov 98
<i>Pheidole barbata</i>	1c, 4c	1-8 Nov 96
<i>Pheidole desertorum</i>	2c, 3a, 5c	18 Apr - 17 Oct 96
	6a	23 Nov 97
<i>Pheidole hyatti</i>	3a, 5c	19-26 Feb 97
<i>Pogonomyrmex californicus</i>	1a-b, 3b, 4a, 4c, 5a	18 Mar - 26 Jun 96
	2c, 3a-b, 4a, 6b, 7a, 8a, 9a	5 Mar - 20 Nov 97
	8b, 9a	23 Nov - 10 Jul 98
<i>Pogonomyrmex rugosus</i>	1c-d, 2a-c, 3a-c, 5c	29 Mar - 8 Nov 96
	1a, 2a, 2d, 3a, 7a-b, 9a	12 Feb - 12 Oct 97
	8a, 9a, 10c	23 Nov - 26 May 98
<i>Solenopsis xyloni</i>	1a-b, 2a, 3a-b, 4c, 5b	18 Mar - 22 Oct 96
	3a, 6b, 7a-b	26 Feb - 20 Nov 97
	6a, 9a, 10a	23 Nov - 29 Jul 98
<i>*Tapinoma sessile</i>	6a	18 Jun 98
<b>Gasterupidae</b>		
<i>Gasteruption nevadae</i>	7a	7 May 97
<b>Halictidae</b>		
<i>Agapostemon melliventris</i>	1a, 3b	11 Jul - 8 Nov 96
	3b	11 Aug 97
<i>Agapostemon texanus</i>	1a	16 Apr 96
<i>Augochlora</i> species	3b	4 Apr 96
<i>Dialitus</i> species	1a-b, 2a, 3a-b, 4a-b, 5a-b	18 Mar - 22 Oct 96
	1a, 3b-c, 6a-b, 7a-b, 9a, 9b	7 May - 5 Oct 97
	6a, 8a-b, 9a, 10d	16 Jun - 10 Sep 98
<i>Dufourea mulleri</i>	3a, 5b	11-18 Apr 96
<i>Halictus farinosus</i>	1a	8 Nov 96
	9a	10 Jul 98
<i>Lasioglossum sisymbrii</i>	1a, 4c	9-16 Apr 96
Species 1	3b, 4a	9 Apr - 11 Jul 96
	3b	11 Aug 97
Species 2	1a, 3b, 6a, 7a-b, 8a	7 May - 5 Oct 97

**Icheumonidae**

<i>Anomalon</i> species	1c	8 Jul 96
<i>Charops</i> species	1c	16 Apr - 8 Jul 96
<i>Compsocryptus</i> species	5b	11 Apr 96
	4b	5 Mar 97
<i>Cremastus</i> species	5a	22 Oct 96
<i>Eridolius</i> species	5c	11 Apr 96
<i>Erigorgus</i> species	5b	11 Apr 96
<i>Netelia</i> species 1	1a	16 Apr 96
	6a	1 May 98
<i>Netelia</i> species 2	3b	9 Oct 96
<i>Ophion</i> species	1a	16 Apr 96
	6a	1 May - 18 Jun 98
<i>Pterocormus inurbanus</i> gp	3b	18 Apr 96
	6a, 8a	1-21 May 98
Species 1	2c, 6b, 9a	25 Mar - 3 May 97
	6a	1 May - 18 Jun 98
Species 2	1a, 6b	3 May - 20 Oct 97
Species 3	2a, 4a, 6a	29 Jan - 2 May 97
Species 4	2c	25 Mar 97
Species 5	6a	2 May 97
Species 6	9a	25 Mar 97
	6a, 10c	1-26 May 98
Species 7	9a	25 Mar 97
Species 8	2c	25 Mar 97
Species 9	2c, 4a	5-25 Mar 97
Species 10	1b	20 Oct 97
Species 11	1a	6 Sep 97
Species 12	1a	8 Apr 97
Species 13	2b, 4b, 5c	11 Apr - 17 Oct 96
Species 14	5c	15 May 96
Species 15	4b	1 Nov 96

**Megachilidae**

<i>Anthidium ehrhorus</i>	1a, 5b	15-30 May 96
<i>Anthidium cockerelli</i>	1a	30 May 96
<i>Anthidium jocosum</i>	2a	2 May 96
<i>Ashmeadiella bigelovae</i>	1b, 2b, 5b	2-30 May 96
<i>Ashmeadiella prosopidia</i>	5b	15 May 96
	7a-b	7 May 97
<i>Ashmeadiella rhodognatha</i>	5b	15 May 96
	7a-b	7 May 97
<i>Coelioxys grindeliae</i>	1a	25 Sep 96
* <i>Dianthidium grindeliae</i>	8b	10 Jul 98
<i>Dioxys pacificus</i>	5a	11 Apr 96
<i>Dioxys pomonae</i>	5a, 5c	11 Apr 96
<i>Haplitis bisentellus</i>	5a	9 May 96
	6a	2 May 97
<i>Megachile brachleyi</i>	1a	15 Sep 95

<i>Megachile brevis</i>	1a	8 Jul - 6 Aug 96
	3b	11 Apr - 11 Aug 97
<i>Megachile conerinnæ</i>	3b	6 Jun - 2 Aug 96
	3b	11 Aug 97
<i>Megachile discorhina</i>	7b	15 May 96
<i>Megachile gravita</i>	2a	13 Jun 96
<i>Megachile lobatifrons</i>	1a, 2a	13 Jun - 4 Sep 96
<i>Megachile nevadensis</i>	1a	15 Sep 1995
	1a, 3d	25 Sep - 3 Oct 96
<i>Megachile newberryæ</i>	1a	6 Jun 96
	1a	30 May 96
	7a-b	7 May 97
<i>Megachile prosopidia</i>	1a	6 Aug 96
<i>Megachile texana</i>	1a	6 Jun 95
<i>Megachile</i> species	2c, 6a, 7b	25 Mar - 7 May 97
	10c	26 May 98
<i>Osmia crassa</i>	5a	11 Apr 96
<i>Osmia liogastru</i>	4a, 5a	9-11 Apr 96
	9a	25 Mar 97
<i>Osmia marginalis</i>	5a	11 Apr 96
<i>Osmia nothosmia</i>	5a	11 Apr 96
	1a	8 Apr 97
<i>Osmia titusi</i>	5a	11 Apr 96
	1a	8 Apr 97
	6a	1 May 98
<i>*Trachusa larreæ</i>	10c	26 May 98
<b>Megaspilidae</b>		
<i>Dendrocerus</i> species	4a	18 Sep 96
<b>Melittidae</b>		
<i>*Hesperapsis</i> species	10c	26 May 98
<b>Multillidae</b>		
<i>Chyphotes melaniceps</i>	1a, 2c, 5a	13 Jun - 17 Oct 96
	7a, 8a, 9a	16 Jul - 29 Aug 97
	8b, 9a	21 May - 10 Jul 98
<i>Chyphotes mickeli</i>	2c, 3b	2 Apr - 4 Sep 96
<i>Chyphotes nubeculus</i>	3b, 4a, 5a	11 Sep - 9 Oct 96
	1a, 7a, 9a	7 May - 20 Sep 97
	8b	10 Jul 98
<i>Dasymutilla californica</i>	3b-c	6 Jun 96
<i>Dasymutilla phaon</i>	1a	6 Jun 97
<i>Dasymutilla</i> species 1	3b	6 Jun - 9 Oct 96
<i>Dasymutilla</i> species 2	6a	2 May 97
<i>Odontophotosis inconspicua</i>	1a	15 Sep 1995
	7b	3 May 97
<i>Sphaerophthalma blakei</i>	3a, 8a	16 Jul - 21 Sep 97
<i>Sphaerophthalma</i> species 1	2a, 2c	13 Jun 96

	3b, 8a, 9a	11 Apr - 2 Aug 97
	6a, 8b, 10d	29 Jul - 10 Sep 98
<i>Sphaerophthalma</i> species 2	3b	6 Jun 96
<i>Sphaerophthalma</i> species 3	2c	17 Oct 96
<i>Sphaerophthalma</i> species 4	3b	9 Oct 96
<i>Sphaerophthalma</i> species 5	1a, 2c, 3b, 4a, 4c	9 May - 17 Oct 96
	6a, 8b, 10d	16 Jun - 10 Sep 98
Species 1	7a, 8a	16 Jul - 14 Sep 97
<b>Mymaridae</b>		
Species 1	6a	2 May 97
<b>Orymyridae</b>		
Species 1	4a	9 May 96
Species 2	1c	30 May 96
	6a	5 Oct 97
<b>Perilampidae</b>		
Species 1	1c, 3b	30 May - 11 Jul 96
	3b	11 Apr 97
Species 2	2a, 5a	11 Apr - 22 Oct 96
	7b	7 May 97
<b>Platygasteridae</b>		
<i>Imostemma</i> species	6a	2 May - 5 Oct 97
<i>Isostasius</i> species	2c, 5c	17-22 Oct 96
<i>Platygaster</i> species	2d, 6a, 7b, 8a	7 May - 5 Oct 97
<i>Synopeas</i> species	5a-b	22 Oct 96
	2c	25 Mar 97
<b>Pompilidae</b>		
<i>Ageniella blaisdelli</i>	1c, 3b	8-11 Jul 96
<i>Anoplius deora</i>	1b, 3b	3 May - 3 Oct 96
<i>Anoplius dreisbachi</i>	3b	18 Apr 96
<i>Anoplius imbellis</i>	1a-c, 3b-c, 4c, 5a-c	18 Apr - 2 Aug 96
	1b, 3b, 7b, 8a	13 Jun - 6 Sep 97
	6a	23 Nov - 18 Jun 98
<i>Anoplius tenebrosus</i>	3c	11 Jul 96
<i>Anoplius toluca</i>	3b	11 Jul 96
	6a	23 Nov 98
<i>Aporinellus yucatanensis</i>	1a, 5b	15 May - 22 Oct 96
	3b, 7a-b, 9a	7 May - 12 Oct 97
<i>Aporus hirsutus</i>	1c	30 May 96
* <i>Hemipepsis</i> species	9a	10 Jul 98
<i>Pepsis chrysothemia</i>	1a, 2a, 3b-c, 4b-c, 5b	9 Apr - 11 Jul 96
	8c, 10d	16 Jun - 29 Jul 98

*Species 1	10a	29 Jul 98
*Species 2	6a	18 Jun 98
<b>Proctotrupidae</b>		
*Species 1	1a, 2c	13 Jun - 8 Jul 96
<b>Pteromalidae</b>		
<i>Scutellista</i> species 1	1b, 3b	11 Jul - 25 Sep 96
Species 1	1a, 1c, 3b, 4a, 5a-c	18 Mar - 22 Oct 96
Species 2	1a-b, 2a, 3b-c, 4b 6a	4 Apr - 11 Jul 96 18 Jun 98
Species 3	1b-c, 3a-b, 5a, 5c	11 Apr - 22 Oct 96
Species 4	1c, 2b	29-30 Mar 96
Species 5	4b, 5a 8b, 9a	11 Apr - 9 May 96 16 Jun - 10 Jul 98
Species 6	5a	11 Apr 96
Species 7	3c	4 Apr 96
Species 8	4b	9 May 96
Species 9	4b	9 May 96
<b>Scelionidae</b>		
<i>Gryon radiculare</i>	2c, 3b	13 Jun - 11 Jul 96
<i>Psix tunetanus</i>	1c, 2a, 3b 9a	2 May - 11 Sep 96 10 Jul 98
<i>Trissolcus</i> species	3c 8a	6 Jun 96 16 Jul 97
<b>Scoliidae</b>		
<i>Campsomeris plumipes</i>	1a, 3b 8a	8 Jul - 6 Aug 96 16 Jul 97
<i>Scolia</i> species	1a, 3b	8 Jul - 6 Aug 96
<b>Sphecidae</b>		
<i>Acistroma</i> species	6a	2 May 97
<i>Ammophila alberta</i>	1a, 2a, 3a 1d, 7a, 8a 10a	6 Jun - 11 Jul 96 13 May - 16 Jul 97 29 Jul 98
<i>Ammophila placida</i>	2c, 7a	25 Mar - 7 May 97
<i>Ammophila pruinosa</i>	1a, 3b, 4a, 4c, 5a-b 6a, 7a, 8a, 9a-b 6a, 8c, 9a, 10b, 10d	9 May - 22 Oct 96 3 May - 5 Oct 97 18 Jun - 19 Aug 98
<i>Ammophila wrightii</i>	6b 6a	3 May 97 23 Nov - 18 Jun 98

<i>Ammophila</i> species 1	5b	22 Oct 96
	6a	23 Nov 98
<i>Ammophila</i> species 2	4a	9 Apr 96
<i>Aphlanthops hispidus</i>	7a	7 May 97
<i>Astata nubecula</i>	6a	2 May 97
	6b	18 Jun 98
<i>Belomicrus eriogoni</i>	2d	13 May 97
<i>Bembix americana</i>	1a, 3b	6 Jun - 6 Aug 96
	3b	11 Aug 97
<i>Bembix sayi</i>	1a	6 Sep 97
<i>Cerceris acanthophi</i>	8a	13 May 97
* <i>Cerceris bridwelli</i>	6a, 10b	18 Jun - 29 Jul 98
<i>Cerceris californica</i>	2a, 5b	15 May - 13 Jun 96
	6a	18 Jun 98
<i>Cerceris convergens</i>	1a	8 Jul 96
* <i>Cerceris macswaini</i>	9a	10 Jul 98
<i>Cerceris sextoides</i>	3b	2 Aug 96
<i>Cerceris</i> species 1	4a	5 Jul 96
	6a	1 May 98
<i>Cerceris</i> species 2	1a	8 Apr 97
* <i>Cerceris</i> species 3	6a	1 May 98
<i>Chalybion californicum</i>	3b	11 Jul 96
<i>Clypeadon lacticinctus</i>	3c	9 Oct 96
<i>Diodontus</i> species	5b	11 Apr 96
	1a, 3b	8 Apr - 2 Jun 97
<i>Dryudella aspersa</i>	1a, 5a	11-16 Apr 96
	10b	29 Jul 98
* <i>Dryudella</i> species	8b	10 Jul 98
<i>Entomognathus</i> species 1	3d, 7a	29 Jun - 21 Sep 97
<i>Entomognathus</i> species 2	3d	21 Sep 97
* <i>Eucerceris arenaria</i>	6a, 9a, 10a,	
	10d	18 Jun - 29 Jul 98
* <i>Eucerceris nevadensis</i>	6b	18 Jun 98
<i>Fernaldina lucae</i>	2a	13 Jun 96
	8a	16 Jul 97
<i>Foxia navajo</i>	1a-b	8 Jul - 6 Aug 96
	6b	18 Jul 98
* <i>Foxia</i> species	6b	18 Jun 98
<i>Glenosticta argentata</i>	3b	2 Aug 96
<i>Glenosticta scitula</i>	1a	30 May 96
	10d	29 Jul 98
* <i>Hoplisoides diversus</i>	6a	18 Jun 98
<i>Larropsis tenuicornis</i>	1a, 4b	9-30 May 96
	6b	18 Jun 98
<i>Liris</i> species	3b	11 Jul 96
<i>Microbembix argyropleura</i>	1a-b, 5a	15 May - 6 Aug 96
	7b	29 Aug 97
	10b	29 Jul 98
<i>Mimesa cahuilla</i>	6a	2 May 97

<i>Ochleroptera</i> species	7b	7 May 97
<i>Oxybelus argenteopilosus</i>	3a-b	6 Jun - 2 Aug 96
	3b	11 Apr 97
<i>Oxybelus</i> species 1	1a-b	25 Sep 96
	1a	6 Sep 97
	6a	18 Jun 98
* <i>Oxybelus</i> species 2	6b, 10d	18 Jun - 29 Jul 98
<i>Palmodes californica</i>	4a	9 May 96
	10d	29 Jul 98
<i>Palmodes</i> species	1a, 1c, 3a-c	30 May - 6 Aug 96
<i>Philanthus californicus</i>	1a	6 Jun 95
<i>Philanthus levini</i>	1a, 3b	8 Jul - 9 Oct 96
	8b	19 Aug 98
<i>Philanthus multimaculatus</i>	1a, 3b	8 Jul - 9 Oct 96
<i>Philanthus ventilabris</i>	1a, 3b	2 Aug - 9 Oct 96
* <i>Podalonia argentipilis</i>	6a, 10c, 10d	1-26 May 98
<i>Podalonia deserticola</i>	1a, 2b, 3a, 3c,	
	4b, 5a-b	4 Apr - 8 Nov 96
	1a-b, 5b, 7a-b,	
	8a, 9a	19 Feb - 20 Oct 97
	6a, 8a, 9a	1 May - 10 Jul 98
<i>Podalonia luctuosa</i>	2b, 3a, 3c,	
	5b-c	29 Mar - 15 May 96
* <i>Podalonia sericea</i>	6b	18 Jun 98
<i>Prionyx foxi</i>	1a, 2a-b, 4a,	
	5a	13 Jun - 18 Jul 96
	10a	29 Jul 98
<i>Prionyx parkeri</i>	1a-b, 2a-b, 3a,	
	3c, 5a-b	2 May - 25 Sep 96
	7a-b	7 May 97
<i>Sceliphron caementarium</i>	1a, 3b	30 May - 6 Aug 96
	3a	21 Sep 97
<i>Sphecius convallis</i>	3b	11 Jul - 2 Aug 96
<i>Sphex ashmeadi</i>	1a, 5b	6 Aug - 11 Sep 96
	6a	22 Aug 97
	6a, 10a, 10d	1 May - 29 Jul 98
<i>Sphex ichneumoneus</i>	3b	11 Jul - 2 Aug 96
<i>Steniolia duplicata</i>	1a, 2a-b, 3a-c,	
	5a-c	15 May - 22 Oct 96
	1a, 3b, 7b, 8a,	
	9b	7 May - 6 Sep 97
	8a-b, 9a	10 Jul 98
<i>Tachysphex ashmeadii</i>	1a-b, 3c, 5b	30 May - 6 Aug 96
	10b	29 Jul 98
<i>Tachysphex coquiletti</i>	1a-b, 2a, 3b,	
	4b, 5b	2 May - 11 Jul 96
	6b	18 Jun 98
<i>Tachysphex texanus</i>	1a, 2a, 5b	15 May - 4 Sep 96
<i>Tachysphex</i> species	6a	13 Jun 97



- <i>Tachytes erimineus</i>	1a, 2a, 4a	13 Jun - 6 Aug 96
	7a	29 Jun 97
	10a	29 Jul 98
<i>Tachytes</i> species	3b, 7b	11 Aug - 12 Oct 97
	10d	29 Jul 98
<i>Trypoxylon aldrichi</i>	6a	2 May 97
<i>Trypoxylon californicum</i>	3b	6 Jun 96
Species 1	1a, 3a-c	6 Jun - 11 Jul 96
Species 2	1a, 3b-c	6 Jun - 11 Jul 96
Species 3	5b	15 May 96
Species 4	5b	26 Jun 96
Species 5	7b	7 May 97

### Tiphiidae

<i>Brachycistis carinata</i>	1a, 3b, 4c, 5a	9 May - 11 Sep 96
	1a, 3b, 5a, 8a,	
	9a	2 Aug - 5 Oct 97
	6a, 8b, 10d	10 Jul - 10 Sep 98
<i>Brachycistic ioachinensis</i>	2c, 3b	2 Apr - 17 Oct 96
	6a, 7a, 8a	7 May - 29 Aug 97
<i>Brachycistic inaequalis</i>	1a, 2c, 3b, 4c	2 Apr - 17 Oct 96
	3a, 6a, 7a 8a,	
	9a	3 May - 5 Oct 97
	6a, 8b, 10d	16 Jun - 10 Sep 98
<i>Brachycistic lacustris</i>	1a, 3b, 4c, 5a	16 Apr - 11 Sep 96
	6a, 8b, 10d	1 May - 29 Jul 98
<i>Brachycistic triangularis</i>	4a	18 Sep 96
<i>Brachycistic</i> species 1	4a, 4c, 5a	9 May - 18 Sep 96
<i>Brachycistic</i> species 2	1a, 2c	13 Jun - 4 Sep 96
<i>Brachycistic</i> species 3	7a, 8a	23 May - 16 Jul 97
	6a, 8b, 10d	16 Jun - 29 Jul 98
Species 1	6a, 8a, 9a	16 Jul - 14 Sep 97
Species 2	1a, 3b, 6a	11 Apr - 6 Sep 97
Species 3	6b	3 May 97
Species 4	1a, 3b, 7a	7 May - 6 Sep 97
Species 5	1a, 8a, 9a	13 May - 6 Sep 97
Species 6	8a	16 Jul 97
Species 7	4b	5 Mar 97
Species 8	1c	30 May 96

### Torymidae

Species 1	2a	17 Oct 96
Species 2	5c	11 Apr 96
Species 3	5b	22 Oct 96
	1a, 3b, 6a, 7a,	
	8a	22 Apr - 12 Oct 97
Species 4	1a	30 May 96
Species 5	1a	18 Mar 96
	9a	20 Sep 97

Species 6	2a	13 Jun 96
Species 7	7b, 8a	12 Oct 97

### Vespidae

<i>Ancistrocerus adiabatus</i>	5a	22 Oct 96
<i>Ancistrocercus lineativentris</i>	2c, 9a	25 Mar 97
<i>Eucdynerus annulatus</i>	1a, 1c, 4a	5 Jul - 6 Aug 96
	8a	16 Jul 97
<i>Eucdynerus exoglyphus</i>	1c, 3a-b, 5b	6 Jun - 2 Aug 96
<i>Eucdynerus nidalgo</i>	1a, 3a	8-11 Jul 96
<i>Eucdynerus</i> species 1	1a, 3b, 8a	16 Jul - 6 Sep 97
<i>Eucdynerus</i> species 2	3d, 7b, 8a, 9a	7 May - 21 Sep 97
* <i>Eumenes bollii</i>	9a	10 Jul 98
<i>Eumenes crucifera</i>	3b	11 Jul - 2 Aug 96
<i>Leptochilus electus</i>	2a-b	2 May - 4 Sep 96
	9b	13 May 97
	6a	18 Jun 98
<i>Leptachilus propodealis</i>	6b	3 May 97
<i>Leptachilus</i> species	2b, 5a	26 Jun 96
	2d, 8a	13 May - 16 Jul 97
<i>Parancistrocersu mcclayi</i>	1a, 3b	6 Jun - 25 Sep 96
<i>Polistes fuscatus</i>	3a-c	4 Apr - 9 Oct 96
	3a-b, 3d	11 Aug - 21 Sep 97
* <i>Pterocheilus mirandus</i>	9a	10 Jul 98
<i>Pterocheilus trachysomus</i>	5b	26 Jun 96
	8b	19 Aug 98
<i>Pterocheilus</i> species	2a	13 Jun 96
<i>Stenodynerus pulviventis</i>	1a-b, 3b	11 Apr - 20 Oct 97
<i>Vespula pensylvanica</i>	1a	8 Nov 96
Species 1	7a	7 May 97
Species 2	7b	29 Aug 97

<sup>1</sup> The localities were as follows:

- 1a = Branch Memorial Park
- 1b = south end of Buckhorn Dry Lake
- 1c = area 2 miles south of Branch Memorial Park
- 1d = 2 miles N Branch Memorial Park
- 2a = Red Hill
- 2b = northwest end of Rosamond Dry Lake
- 2c = east end of Rosamond Hills
- 2d = W Red Hill
- 3a = west side of Piute Ponds
- 3b = north side of Piute Ponds
- 3c = 1.5 miles north northwest of Piute Ponds

- 3d = E Piute Ponds
- 4a = 1 mile north of Mercury Blvd and 1 mile east of Rogers Dry Lake
- 4b = peaks of northeast side of Rogers Dry Lake
- 4c = 1.5 miles northeast of peaks
- 5a = sand dunes 2.5 miles north of Avenue B on west side of Mercury Blvd.
- 5b = mesquite woodland just north of Avenue B and just west of intersection with 140th street
- 5c = west side of sewage ponds on west side of Rogers Dry Lake
- 6a = NW Leuhman Ridge
- 6b = NE Leuhman Ridge
- 6c = 3 miles N Leuhman Ridge
- 7a = N 165th Street
- 7b = W 140th Street
- 8a = 1 mile E intersection of Sopp Road and Pole Line Road
- 8b = 3.6 miles E intersection
- 8c = 5 miles E intersection
- 8d = N Rosamond Hills
- 9a = W Bissell Hills
- 9b = W Rosamond Hills
- 10a = 200th street S of C
- 10b = 200th street N of C
- 10c = Red Buttes
- 10d = Kramer Hills

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

<b>1. AGENCY USE ONLY (Leave blank)</b>		<b>2. REPORT DATE</b> November 2000	<b>3. REPORT TYPE AND DATES COVERED</b> Final report	
<b>4. TITLE AND SUBTITLE</b> Terrestrial Arthropods of Edwards Air Force Base, 1996-1998			<b>5. FUNDING NUMBERS</b>	
<b>6. AUTHOR(S)</b> Gordon Pratt				
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> University of California at Riverside Department of Entomology Riverside, CA 92521			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b> ERDC/EL TR-00-20	
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> Edwards Air Force Base, Edwards, CA 93523; U.S. Army Engineer Research and Development Center, Environmental Laboratory, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199			<b>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>	
<b>11. SUPPLEMENTARY NOTES</b>				
<b>12a. DISTRIBUTION/AVAILABILITY STATEMENT</b> Approved for public release; distribution is unlimited.			<b>12b. DISTRIBUTION CODE</b>	
<b>13. ABSTRACT (Maximum 200 words)</b> <p>A terrestrial arthropod survey was performed at 32 sites on Edwards Air Force Base (EAFB) from January 1996 through October 1998. Additional species found during a 1994 through 1998 butterfly survey have been added to the list. Survey methods involved sweeping of blooming and nonblooming vegetation, searching for arthropods beneath rocks, logs, and other objects, searching for diurnal and nocturnal crawling, flying, and calling arthropods (by hearing), collecting nocturnal arthropods drawn to a mercury vapor light, and those arthropods that have fallen into pitfall traps. From this study, over 15,000 arthropods representing 1,536 species were pinned or preserved in alcohol, labeled, and curated into the collection. During this study period, over 930, 770, and 400 species were collected in 1996, 1997, and 1998, respectively. In 1997 and 1998, over 300 and 100 new species, respectively, were added to this study of the EAFB. Of these species, approximately 96 percent were insects and over 80 percent belonged to the four major insect orders: Coleoptera, Lepidoptera, Diptera, and Hymenoptera. An additional 14 percent belonged to the next four major insect orders: Orthoptera, Homoptera, Hemiptera, and Neuroptera. At least three new species of Gryllacrididae and one new Scarabaeidae have been found. There are probably many other unrecognized species. There have also been many range extensions found by this survey. For example, of the four <i>Cicindela</i> species collected, two were major range extensions for their species.</p>				
<b>14. SUBJECT TERMS</b> Arthropods Conservation Environmental impacts			Insects Invertebrates Mojave Desert	Scorpions Spiders Survey
			<b>15. NUMBER OF PAGES</b> 99	<b>16. PRICE CODE</b>
<b>17. SECURITY CLASSIFICATION OF REPORT</b> UNCLASSIFIED	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> UNCLASSIFIED	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b>	<b>20. LIMITATION OF ABSTRACT</b>	