CHILEAN EXPEDITION 2001
-Elizabeth T. Arias, post-doctoral researcher

During the past few years I have seen many Chilean temperate forests destroyed by industrialization. With the hope of measuring and thereby mitigating some of this destruction, I started a project in Spring 2001 to quantify biodiversity through arthropod monitoring in the Chilean temperate forests.

Members of the expedition were: Fred Andrews (CDFA, Sacramento), Julie Andrews (Sacramento), Alda Gonzalez (CEPAVE, Mar del Plata), Terry Cuneo (Davis), Steve Lew (UC Berkeley), Patricio Caroca (ChileFog, Santiago), Cristian Muñoz (Universidad de Talca, Talca), and Sergio Ocare (Chillán Cordillera). We first convened in Santiago where Andres Gabor provided the rooms and rental cars (also free capuccino on the day of departure!). From here we drove to the Chillán Cordillera. The insects of these forests provided a source of constant fascination, sometimes showing an ethereal presence, such as when the golden scarabs were flying from the tips of Nothofagus, leaving light trails through the trees. We stayed at Hotel Los Pirineos where we rented a storage room for our equipment.

Collecting was by canopy fogging after we had first positioned Malaise and pan traps beneath the Nothofagus trees. We had a great time collecting fogged arthropods from the traps and placing them in whirl-pack bags in 95% ethyl alcohol. Our expedition continued towards the Cordillera of Nahuelbuta, a paradise of 7000 ha on the coast of the Chilean Cordillera. Here the cathedral forests can reach a height of >30 m in the heart of the park, with a substantial amount of old growth. A mass of

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Cake from Darwin's Birthday Celebration

This has been another exciting year for the Essig Museum, marked by the arrival of a new faculty member and a database manager, as well as the inauguration of a student seminar series. First, in July 2001 Dr. Kipling Will joined the faculty in Insect Biology. Kip received his PhD from Cornell, under the advisiorship of Dr. Jim Liebherr. He went on to do a postdoc at the University of Arizona with David Maddison, before coming to UC Berkeley. His research focuses on the systematics, taxonomy and natural history of ground beetles. He is particularly interested in the chemical defense system of the beetles, their reproductive biology and biogeogra-

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Insects of Silversword Hybrids
- Allison Drew, Graduate Student

The Hawaiian Silversword alliance is composed of about thirty extremely diverse plant species that are spread throughout the five major islands. The plants range from low shrubs that colonize bare lava flows, to rainforest trees, to the dramatic Silversword, whose flowering stalk can exceed nine feet in height. This diversity of species descends from a Californian ancestor that colonized the islands about 4 million years ago. Because the thirty species evolved so rapidly, they are still very closely related, and many pairs can interbreed to form hybrids. These hybrid zones present a unique opportunity to study many different ecological and evolutionary processes. For example, because some characteristics (such as plant chemistry) may form a gradient through the hybrid zone from one parent species to the other, the hybrid zones can be used to look at factors influencing host plant choice by herbivorous insects.

Crater – one plant species inhabits the top of the ridge, the other the bottom of the ravine, and the hybrid is on the slopes. The second hybrid zone, inside the crater, is interesting because the hybridizing plants are in different genera. A third hybrid zone is in the Alakai Swamp - a high altitude (4000 ft) bog on Kauai. The swamp is a mosaic of wet forest and bog, and the hybrid plants are on the boundaries of these habitats. The last three zones are on the Big Island, with one on the saddle between the two immense volcanoes, Mauna Loa and Mauna Kea, where different-aged lava flows form a mosaic. The two parent plants in this hybrid zone are found on different types of lava substrates and the hybrids are found where these lavas converge. The final zone is high on the slopes of Mauna Kea in an area that has been fenced in to protect the Silverswords from ungulates and thereby safeguard the tiny wild population from extinction. In this area three different species all interbreed resulting in a complex hybrid swarm whose plants span a wide variety of morphologies.

In the majority of cases, I found that there was an intermediate number and diversity of insects and insect species on hybrid plants as compared to parent species. Many features of the hybrid plants were intermediate between those of parent species – for example, when one parent’s leaves exude a sticky goo and one parent’s do not, the hybrids tend to have leaves of a medium stickiness. Since stickiness deters insect feeding, it’s not surprising that we find few on the sticky leaves and intermediate numbers on the hybrids. This pattern probably holds for many of the plant traits that determine how resistant a plant is to attack by herbivores. More patterns may emerge as I continue to sort through my insects and examine specific taxa in detail (endemic Hawaiian planthoppers) to determine how different species change in abundance or diversity across the hybrid zone.

Many studies have been conducted in hybrid zones over the last two decades to try to describe how they are used by herbivorous insects. These studies, conducted on a huge range of plants, from conifers to yuccas, have given mixed results - but it is not surprising that insects would respond differently to these very different hybrid zones. My question was, could I find consistent patterns across more similar hybrid zones?

I studied six different hybrid zones of species within the closely related silversword alliance on three Hawaiian Islands this summer. Two of the hybrid zones were on the island of Maui in Haleakala National Park. One is in a steep ravine on the outer slopes of Haleakala.
different species carpets the floor of the forest with spider webs glistening in the rays of sunlight that penetrate the closed canopy. The umbrella shape of the *Araucaria* trees gives the landscape a prehistoric appearance and it was easy to imagine that dinosaurs might be lurking around. We found several strikingly colored carabids under the tree trunks, and at sunset stag beetles filled the air as they searched for mates. Male tarantulas walked slowly through the debris trying to hide from our curious eyes. Later in the day the Conaf guards, Nelson and Alvaro invited us to a lamb barbecue with beer, wine, and guitar music.

We continued our trip towards Flor del Lago, Pablo Wagner’s ranch. The magnificent Volcano Villarica looms over this 4000 ha area by Lake Villarica. This volcano displays a perpetual plume of smoke warning tourists that at any moment it could start spewing a dangerous tongue of lava, as it has done in the recent past. The farms in the area, enriched by colorful native bushes and flowers, are juxtaposed with large expanses of cathedral forests, their floors covered by lichens and ferns. Gigantic fungi, over 50 cm diameter, embrace the trunks of these trees, and native orchids are scattered exquisitely through the forest. Many arthropods came down from the canopies of these trees when we fogged.

We visited the Huerquehue National Park, where we had another barbecue with the guards by the lake. The guards told us that they were on strike for better salaries but they were at their sites because they wanted to protect their park. We ended the expedition at Malalcahuello and Conguillio. Here the wind made fogging a challenge, but we managed to collect insects and spiders from the *Araucaria* crowns.

In total, our expedition collected over 50,000 specimens that are now in the process of being sorted at the California Department of Food and Agriculture (CDFA) in Sacramento, and at the Essig Museum. The Hymenoptera will be donated to the R.M. Bohart Museum. I hope to repeat this project next season, this time including Chiloe Island. In this way, ventures to understand and hence preserve and protect the fauna of Chilean temperate forests could become a reality.

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phy. Kip is expected to take up the position of Associate Director of the Essig Museum.

Kip has been very active in organizing events for the museum, first, a commemoration of the 193rd anniversary of Charles Darwin’s birth on 12th February. For this, the Essig Museum hosted an open house, which was very well attended by the museum folks on campus, as well as some from Davis, Sonoma, and elsewhere in the Bay area. Kip has also organized the first Essig Museum field trip of the 21st century! This field trip is part of the Museum’s mission to survey insects in California and promote training in field and specimen handling methods. It will take place over Spring Break, and will be based east of San Diego in the southern part of the Cleveland National Forest around the Lake Morena area, with trips to the Hauser Wilderness area and the Algondones Dunes.

New faculty: Kip Will, beetle systematist

Another exciting hire has been that of Gordon Nishida. Gordon has had 25 years experience as collections manager at the Bishop Museum in Honolulu, where he developed a tremendously useful database allowing the user to search for species based on geographic locality, taxonomic affinity, status (endemic, native, introduced), etc. He has been working at the Essig Museum since

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One Week in Rurutu
-Elin Claridge, Graduate Student

The Austral Islands are one of the most remote archipelagos in the world. The archipelago is the most southerly in French Polynesia, over 600 km south of Tahiti, lying along the Tropic of Capricorn. There is nothing between this chain of small islands and the frozen Antarctic continent, except the wide expanse of the Pacific Ocean. This gives the Australs a definitely more temperate feel than those of its sister archipelago the Society Islands*. A cool breeze blows in the evenings and there is a more marked seasonality, mangoes fruit only once a year here and citrus trees grow in abundance.

The Australs were the last islands to be settled by the Polynesians (c.1000 A.D.), who are thought to have come from Tahiti or New Zealand. The ancient Austral-islanders had a ferocious reputation. Tales of bloody inter-island tribal warfare and the bravery of Austral warriors have passed into Polynesian folklore. The Bounty’s mutineers famously tried to settle on the island of Tubuai in 1791, but were driven away by the savage islanders. The mutineers eventually settled on deserted Pitcairn Island. Thus, it was with a slight sense of adventure that I visited the island of Rurutu in the Australs last fall.

I had been teaching tropical biology and geomorphology to a class of Berkeley undergraduates at the U.C. Gump Research Station in Moorea for two months. At the end of the field-course I was keen on the opportunity to do some of my own field-work, in one of the wilder corners of French Polynesia. I work on Rhyncogonius, a genus of broad-nosed weevils that is endemic to the Pacific. Species of the genus occur across the ocean, from Hawaii to Pitcairn. There are currently 147 described species, from some of the most isolated islands in the world. My research uses molecular data to study the patterns of island colonization and processes of phylogenetic and ecological diversification within this group.

French Polynesia has been neglected as a research area, and little insect material has been collected since the Bishop Museum’s Pacific Entomology Survey in the 1930s, headed by the Berkeley graduate student Alastair Adamson. In 1932 four species of Rhyncogonius were collected and described from Rurutu. Returning to the island almost 70 years later, I was very interested to see whether I could find these species, and a little apprehensive about how much intact habitat I would be able to find when I got there. French Polynesia has undergone rapid development in the last 20 years as a result of a developing tourist industry.

Rurutu is only 36 km sq, with three small villages and just 2000 inhabitants, mostly Polynesian, with the odd French expat. The tattooed inhabitants of Rurutu turned out to be far from ferocious; rather they were incredibly kind and charismatic, Polynesian traits to which I had become accustomed in Tahiti and Moorea. With the help of the family which ran the guest-house I was staying in, I was able to visit all the main peaks using the bridle-ways which criss-cross the islands. Horses are a common means of travel here and all self-respecting Austral-islanders own at least one horse. I too got to ride bare-back to several of my collecting sites, under the insistence of my zealous host, an experience I will never forget, along with the pain in my aching legs which lasted for the rest of my stay in Rurutu.

The island is rarely visited by tourists, though dedicated whale-watchers and television crews are drawn to the island to film the migrating humpbacks seen off the coast between July and October. There are no luxury hotels on the island, partly because it is not surrounded by the deep azure lagoons which appeal to tourists; rather the reef fringes the island tightly. At dawn and dusk fishermen wade across the coral-heads in gum-boots, collecting urchins and giant clams, both of which are considered local delicacies. The highest peaks on the island are diminutive and lack the lush tropical clothing of vegetation, so characteristic of Tahiti. Taros is a staple food, and taro fields form a patchwork across the island. Overfishing and agriculture are the main threats to the biota here. The impact of feral goats and farming have transformed the high interior of Rurutu. Fields of pineapples, coffee, and plantations of Caribbean pine have replaced the native scrub. Weeds

*The Society islands include Tahiti, Moorea, Bora Bora, Huahine and Raiatea.
grow waist-high along the bridle-ways. Despite this I was able to collect three of the described weevil species, along with species of native spiders and damselflies. One of the weevil species, which feeds on Hibiscus was readily collected from the coast up to the summit of Mt. Manureva (385 m). Only time will tell whether the species I collected are remnants of a disappearing fauna or whether they will continue to persist in this changing landscape.

Further work desperately needs to be done on all of the islands in the Pacific, and students like myself, in the Roderick-Gillespie lab here at U.C. Berkeley plan to explore other islands in French Polynesia and to develop the collections of Pacific insects and arthropods at the Essig Museum.

**Database Initiatives at Essig Museum**

- Gordon Nishida, Museum Scientist

Dr. Gordon Nishida, formerly from the Bishop Museum of Honolulu joins the Essig

The Essig Museum has initiated a series of databases intended to provide current and future users ready access to information on California's arthropods. We have been working on a suite of databases that will allow those needing information in the areas of checklists, distributions, citations, and their supporting authority files.

In view of the estimated 30,000 - 40,000 species in California, the project is expected to take some years to complete. However, the data entry will be approached in a modular fashion, permitting parts of it to become available immediately after data entry and editing. As the original home of the California Insect Survey, the first species based citations project is the *Bulletins of the California Insect Survey*.

When completed, users will be able to request publication and page references for each species databased, including for the original description. Complex searches in the areas of distributional and ecological information included in the original citation will also be available as well as synonyms published in the series. Other important California publications will be added to the database as quickly as the data can be extracted and entered. Lists of species from independent sources will be added to the skeletal California species checklist to populate the table as quickly as possible. References for those species not already in the citations database will be captured later.

In the meantime, we have consolidated a preliminary list of species holdings in the collections. Specimen databasing will not begin until after the Essig collection has been moved. However, the Essig will be participating in a pilot program to provide ecological (collecting) information regarding arthropod species in one of the University Natural History Field Stations — Hastings Reserve in Carmel Valley. This project will consolidate all information regarding the selected reserve from all the collections in the Berkeley Natural History Museums. We will then provide a web interface that will allow the user to ask questions relating to a given species such as “What is the spatial distribution of the species in the landscape?” “With what vegetation is the species associated?” “How can biotic communities be characterized over an elevational gradient?”

**Don’t forget about Cal Day 2002!**

Cal Day 2001: Dan Rubinoff (left) sells t-shirts and helps children make insect art, Cal Day 2002 will be held on April 20th. Wellman Hall will host many insect-related exhibits and activities for adults and children.
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June 2001 on a database for the California arthropod fauna, and reports progress on page 5.

The students of the Essig Museum have also been working hard this year, organizing the first Berkeley Natural History Museums (BNHM) student seminar in February 2001. They invited Professor Guy Bush, the John A. Hannah Distinguished Professor (Emeritus) at Michigan State University. Guy gave two very enlightening seminars on patterns of speciation and the evolution of mate recognition systems, focusing on host-specific flies in the genus Rhagoletis, under different ecological and geographic conditions. Following the afternoon seminar, the students hosted a reception in the Essig Museum, to which students, faculty and friends of the Essig and other BNHMs were invited. The event was great fun, very well attended, and inspired us to organize more of these kinds of activities in the future.

In March 2001, Curator Vince Rosh, Director of UC Berkeley’s Gump Field Station in Moorea, Society Islands, organized “A Trip to Paradise”. Participants were invited to experience the research activities being conducted in Moorea by the students and faculty at UC Berkeley. Because most of the native insects and spiders are confined to higher elevations, there was an expedition across Moorea, led by myself and Dan Rubinoff, along a trail that climbed over 320 m ridge. It was a fairly short but arduous hike with a steep climb to the ridge crest. But experiencing the unique native forest and seeing the spectacular panoramic view of Moorea made it well worth the effort.

As we reported last year, the Museum has funds from the National Science Foundation to upgrade and move the collection into more suitable museum space that is currently occupied by the UC Museum of Paleontology in the Valley Life Science Building on the UC Berkeley campus. The new location will allow closer integration

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Become a friend of the Essig Museum
Your gift to the Essig Museum of Entomology helps support our collections!

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All membership fees and donations are tax-deductible to the limit allowed by law.

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with the other BNHM's. The BNHM's have now established a web site, http://www.berkeley.edu/bnms/ where you can find out more about the different museums, the consortium, and what's going on. Particular enterprises that are afoot include: (i) The California Biodiversity Center (CBC), was established last year to foster synergisms between scientists in the six BNHM's and field scientists on campus who could make use of the Berkeley Natural History Field Stations. The mission of the CBC is to foster studies that reveal impacts on native California biological diversity of environmental change, including that driven by human land use, during the past, present, and projected for the future. One of the priorities of the CBC is to conduct taxonomically focused field trips to the reserves and their environs, and we are currently planning trips focusing on spiders and beetles. (ii) The California Cooperative Ecosystem Studies Unit (CESU) for which Berkeley has recently become host campus, will provide mechanisms for state agencies to undertake cooperative research or education projects with the university. We very much look forward to collaborative efforts to understand the diversity of arthropods in California and the Pacific.

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Lepidoptera Collections Received

- Jerry Powell, Director Emeritus

Several important collections of Lepidoptera, all carefully prepared (spread and labeled specimens) were received as gifts during the past year. This material will greatly enhance our geographic and taxonomic coverage of moths of California and other Nearctic and Neotropical areas and will prove of considerable value to biogeographic and systematics research.

Cheryl Barr, Museum Scientist, donated 430 macro moths and butterflies, mostly from Louisiana and the Gulf States, accumulated prior to her arrival at Berkeley.

Ron Leuschner, Manhattan Beach, CA, gave us 285 identified specimens of Geometridae, many of them species from the southern California and Arizona that we lacked.

Ron Robertson, Santa Rosa, CA, donated 1,663 Geometridae from widespread areas of the western U.S., including many fine additions to our holdings.

Ralph Wells, Jackson, CA, presented 470 Saturniidae and 80 Sphingidae from California, Mexico, and Central America, including paratypes of Hyalophora euryalus cedrosensis and extensive series of rare Saturnia, including many California county records and Mexican representatives of S. albifasciata and S. walterorum.

Ron Wiegus, Kneeland, CA, collected and prepared a year long sample of moths from the Eureka area, a truly fine seasonal and geographic sample of the fauna in that poorly documented region, comprising a gift of 1,460 specimens including more than 120 species of microlepidoptera.
Upcoming Events

20 April Wellman Hall, 9-4 pm
Cal Day with Insect Biology
1-2 pm "Itsy Bitsy Carnivore: Spiders in Biodiversity and Biocontrol."
2-3 pm "The Genetic Detective: origins of Medflies and Other Exotic Pests."
9-4 pm "Insects and Arachnids: The Good, the Bad and the Ugly!"
12-1 pm "Odd tales from the World of Beetles."
Additional program details found at:
http://www.berkeley.edu/calday/

Volunteers needed: We are seeking volunteers to move specimens off styrofoam flats and into unit trays. Contact Cheryl Barr, cbarr@nature.berkeley.edu for more details.

May 31 - June 2, 2001
Workshop: Pollination Ecology of Spring Wildflowers

Gordon Frankie and Robbin Thorp
Location: UC Hastings Reserve, Carmel Valley
Several field exercises are planned to demonstrate how and when flowers make their pollen and nectar rewards available to pollinators, and how pollinators use their behavioral, morphological, and physiological adaptations to extract floral resources. Much of our attention will be focused on the rich variety of solitary bee species (200-250 species) and the flowers they visit at Hastings. Various bee groups will be examined under magnification to observe relevant morphological adaptations. During the evenings, talks will be presented on the topics of pollination syndromes in plants, bee diversity, global pollinator decline, and encouraging pollinators in your backyard environment.

For information on registration and course fees, please contact the Jepson Herbarium (510) 643-7008.