



Bohart Museum Society

Summer 2022

Newsletter

No. 91

In This Issue

This has been an odd year so far. We're still seeing the long term impacts of Covid, but otherwise things seem to be returning to normal. The number of visitors to the museum has been steadily increasing and everyone seems ecstatic to be able to visit and play with the petting zoo again.

We have a terrific group of students and volunteers working in the museum this summer.

July 16 we will be celebrating the 50th anniversary of the designation of the dog-faced butterfly and the California state insect. Please join us for the fun!

-Lynn Kimsey



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SPOTLIGHT ON A SPECIES

Horticultural Warfare?

by Lynn Kimsey



Eucalyptus globulus in Pleasanton, CA. Photo by D. Dalton, Wikipedia.

For more than a century Eucalyptus trees have survived and thrived in California. Eucalyptus originates in Australia where there are more than 700 species. Only a few species have been introduced to California. Many plants have defensive compounds that protect them from herbivores. Eucalyptus is no exception. It has notably high levels of eucalyptol, also known as cineole. Herbivores, like koalas, need to have ways to deal with eucalyptol. In the Americas eucalyptol is highly repellent to herbivores, but it is highly attractive to male orchid bees! When planted overseas in places like California Eucalyptus trees have no native herbivores.

The oils in these trees makes them resistant to herbivores but also highly flammable, so much so that they will sometimes ignite explosively. However, bush fires are the rule in most of Australia, not the exception, so eucalyptus trees are adapted to surviving

bushfires in several ways. Many species can regenerate from buds deep in the thick bark. Other species have lignotubers, which are woody swellings of the root crown that protect the stem. The third adaptation to fire is the dense woody fruit seen in most species that only release the seeds under high heat.

Eucalyptus was first planted in California in the 1850's. What we know of their planting in California seems to be a complicated mixture of history and story-telling. During the Gold Rush a number of daily necessities were in short supply. One of these was firewood. This was a period when wood was used for heating, cooking, locomotion and construction. Most of the regions in California where Europeans settled were grassy, scrubby or marshy, with little useable wood. Immigrants from Australia realized that eucalyptus trees would fulfill most of these needs and would readily grow and thrive in the poor soil and dry



Red gum lerp psyllid on red gum Eucalyptus. Photo by Mark Hoddle, UC Riverside.

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Museum News

Donations

A collection of butterflies from at least four Continents, including Europe, Asia, North America, and South America was donated to the Bohart by Michael Marchiano of the Mt. Diablo Interpretive Association (<https://www.mdia.org/>). Most of the collection dates from the early to mid-1950s. The collector, Michele Benoit, was a French Citizen who worked for Bechtel Engineering a worldwide corporation. Benoit was an engineer working on various construction projects around the world, who had many interests and hobbies, one of which was butterfly collecting. He eventually immigrated to the United States and became a U.S. Citizen.



New Faces in the Museum



Steven Hobbs transferred from Folsom Lake College to UC Davis in 2020 and began working in the museum in 2021. His job was to integrate the Wasbauer spider wasp collection. This June Steven graduated with a Biochemistry degree. He worked with Fran Keller at Folsom City College to develop DNA methods and protocols to become part of the curriculum. Sadly, he won't be working in the museum any more, as he's moving on in his career.



Jacob Hess is a high school student at the Met Charter High School in Sacramento. He's been doing an internship in the Bohart since fall of 2021. Jakob has been a real contributor in the museum and we'll miss him over the summer. He'll be back next fall. We'll be sorry to see him graduate :)

Another student from the Met, Noah Crockett interned in the museum for several years, and graduated from Cornell University this spring.

Larry Snyder Photographer

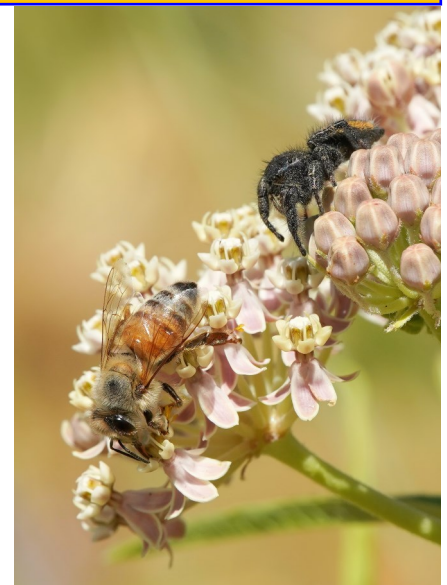


Larry Snyder, local musician and piano specialist has major contributions to the Bohart Museum in recent years. In addition to a very generous

financial donation to our endowment, he has given the Bohart a series of beautiful photographs of milkweed insects. We're planning to use his photographs to do an exhibit on monarch butterflies and milkweeds, beginning with a monarch egg hatching and ending with a mature adult. This should be on display in time for our fall members meeting.



Euodynerus wasp (Vespidae) on milkweed flowers.



Honeybee being stalked by a jumping spider on milkweed flowers.

MORE MUSEUM NEWS :(

Tom Roach 1938-2022

Tom Roach was born in NYC in the fall of 1938. He grew up in the suburbs of NYC, living in Bedford Hills, NY and Westport, CN. Tom developed an early interest in nature and joined the Audubon Society at the age of 8 so he would be able to go on field trips to see the local birds, mammals and insects. Tom graduated from high school in 1957 and attended the University of North Carolina for before leaving to join the United States Air Force in 1958.



In October 1959, Tom was assigned to Misawa Air Base, Japan where he immediately bought a Nikon F at the Base Exchange. He has been photographing as a hobby since then. He retired from the USAF in 1978 and immediately moved to California. He was always interested in nature photography and took "eco-safaris" to Costa Rica, Tanzania and India. He photographed many species of birds, insects, plants and animals. Among his favorite photographs are those of wild tigers in India and Cape buffalo in Tanzania's Ngorogoro Crater.

In 2004 Tom switched from film to digital. Tom's first photographs of odonates were taken shortly after he switched to digital technology using a Nikon D70 to photograph them along the nature trails in the confines of Sun City, a community of 7,500 homes with 18 nature trails. Tom photographed wildlife at Sun City Lincoln Hills [as well as other nearby nature hot spots. His photos were used exclusively for the official Sun City Lincoln Hills calendar, the Sun City Nature Trail Guide, features in the Lincoln Messenger newspaper, and for the Placer Land Trust calendar for 2008.

Tom gave the Bohart Museum a number of terrific dragonfly and damselfly photos. We miss him terribly.

Bye-bye BioQuip

The year 2022 has already brought some big changes ranging from Covid to businesses closing. In February, BioQuip.com announced that they were closing for good. This was bad news for the Bohart and other insect collections and museums across the country. BioQuip was the company we went to for some important museum and teaching supplies. Perhaps most importantly this is where we purchased insect pins. Fortunately, the pins are manufactured in Europe and are available elsewhere. We also got insect nets, student collecting kits and a variety of other supplies from BioQuip. In recent years we have not had to buy any glass-topped specimen drawers because Jeff Smith has been making

drawers for the museum. For the most part he uses salvaged lumber from fences and decks. My old redwood deck became new drawers for the museum. He mostly makes them from pine and redwood. Each one is essentially a work of art. He just recently donated 74 new drawers. This brings his total up to something over 2,200 drawers that he's made from scratch! Fortunately, with BioQuip out of business we have found a source for the label holder/pull tabs for the drawers he makes. Plus we purchased a large number from BioQuip before they closed.



New specimen drawers made by Jeff Smith.

More Sad News

Leo Huitt passed away in December 2021. He was a lifelong resident of Yolo Co. He served in the U.S. Army, and received his Associate in Arts from Sacramento City College in 1969. Leo worked as a Fleet Mechanic at UC Davis for over 30 years. At the same time he began wood carving insects as a kind of hobby. He created a number of beautiful wood carvings of insects for the Bohart Museum, including the black widows to the right, silverfish, walking sticks, stag beetles and more. Leo was so talented and great fun and we miss him.



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conditions found in California. The species they chose were fast-growing and could easily grow 4-6 feet in a single year! These trees were grown both for their wood, as well as to create windbreaks and provide shelter for homes and livestock. Several species were planted, but the most abundant one was blue gum (*Eucalyptus globulus*).

The other advantage of growing Eucalyptus in California was that it was pest free. Because it was introduced from seed, no pests traveled to California from Australia. Native herbivores do not feed on Eucalyptus because of its toxic compounds and not even California termites will feed on the dead wood.

Some of the California eucalyptus plantations were planted to produce hardwood because there was a potentially huge hardwood timber market caused by overharvesting true hardwoods in the eastern United States. Because of this, investors saw eucalyptus as a financial opportunity, thousands of blue gums were planted up and down California as far north as Mendocino.

The predicted hardwood timber famine never happened, and it turned out that blue gum in particular proved to be a poor-quality wood for nearly all purposes. The wood was soft, dried badly, and would crack and split, which made it useless for structural purposes, like construction and particularly for railroad ties. These trees also took up so much water that they could drain adjacent wells. As a result of these issues the market for eucalyptus disappeared, and it wasn't even worth cutting the trees down. What we see today are thousands of acres of a crop that has been abandoned for a century or more.

There's another odd twist to this story. Blue gum apparently cannot produce fertile seeds in California. They need some summer moisture and high heat to do this. Thus, the roughly 40,000 Eucalyptus trees in the state continue to age, still planted in rows, with few if any seedlings. The majority of "new" trees

originate as stump sprouts.

For a long-time these trees seemed to be immortal in California, aside from fueling wildfires. However, in the past few decades insect pests of eucalyptus have begun appearing in California, and some of them can cause significant damage or actually kill the trees. These exotic pests include two species of cerambycid beetle (*Phoracantha recurva* and *P. semipunctata*), and a weevil (*Goniopteris scutellatus*), which have also appeared in other countries where eucalyptus is grown. Today, eight species of lerp psyllids, two leaf beetles, *Trachymela sloanei* and *Chrysophtharta m-fuscum*, and four gall-making eulophid wasps now only occur in Australia and California.

Tim Paine at UC Riverside first noticed eucalyptus trees dying in the mid-1980's. He suspected a cerambycid wood boring beetle based on the kind of damage he found. However, the more he looked into dead and dying Eucalyptus trees the more insect pests he found; nearly 20 species over 25 years. Oddly, the pests didn't arrive in a steady progression, they seemed to arrive in groups each group apparently from a different region in Australia.

So, the question of how the pests got here remains, with explanations ranging from shipping to intentional introduction. Given the large number of flights between California and Australia it may be that these insects are hitching a ride on commercial jets or cargo ships. It is unlikely that psyllids that live under lerps could disperse on their own. Only the males have wings. It is also hard to imagine gall-making eulophids dispersing this way either. In both cases, infested plant material would really need to be moved for them to disperse. It is possible that the beetles could have dispersed by diapausing in cargo containers or being carried in infested wood. Cargo containers crossing the Pacific have enormous potential to move insects from one continent to another. The Port of Oakland handled more than one million 20-foot containers in 2021, and that is only

one of nine major West Coast ports.

Conversely, there are also claims of conspiracy. That the introductions were done to eliminate eucalyptus from California. These conspiracies blame various native plant groups for the deliberate importation of eucalyptus pests. But, at this point there is no evidence for either type of introduction, accidental or intentional.



UC Statewide IPM Project
© 2000 Regents, University of California

UC Statewide IPM Project
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Redgum lerp and lerp psyllid. Photo by Jack Clark Kelly, UC IPM program.



Phoracantha recurva. Photo by Matankic, Wikipedia.



Trachymela sloanei. Photo by Jon Sullivan, Wikipedia.

New Invasive Pests

Agriculture is a major part of the US economy, and anything that negatively affects American agriculture can have significant economic impacts. Agricultural commodities are particularly susceptible to damage from crop pests and surveillance for new pest species is an on-going effort. California alone has 16 border quarantine stations where private and commercial vehicles are inspected for plant material. Texas has more than 1,000 miles of international border to deal with. The federal Agricultural Quarantine Inspection service also inspects vehicles and pedestrians crossing international borders, commercial vehicles and even private and military aircraft.

Some significant interceptions were made this past year by state and federal agency personnel. US Customs and Border Patrol found caterpillars and moths infesting seed pods being transported in a passenger's luggage at a Detroit airport. The pods were intended for medicinal tea. The moth turned out to be a species of pyralid, *Salma brachyscopalis*, that hasn't been seen since it was first described in 1912.

They discovered another potential pest, the so-called Cochabamba leaf beetle in a shipment of fresh fruit from Mexico. The larvae of these

beetles are leaf skeletonizers and the adults feed on foliage as well on a wide diversity of plant species.

Despite all of this effort at the borders pests still make it into the state. In the past year a number of significant pests have been found in California. One of the more spectacular ones is the giant sweetgum aphid, *Longistigma liquidambarus*. This aphid is winged and nearly the size of a housefly. It was first discovered on liquidambar trees in San Francisco and later on these trees in Alameda Co. This aphid is thought to be native to Asia. Its not clear at this point how it got into San Francisco.

Another pest, the grape leaf skeletonizer, *Harrisina americana* (Family Zygaenidae), was found in Napa Co. near a vineyard in May. This moth is native to the eastern US where it commonly defoliates grapes, and native species, like the Virginia creeper. This moth has brilliantly colored caterpillars, striped in black yellow and green. The adults are also a metallic black color, with a red pronotum.

Finally, a major fig pest, the black fig fly, *Silba adipata* (Lonchaeidae) was recently found infesting figs in most of the counties in southern California. These flies lay their eggs in unripe figs and their larvae feed inside the fig making it inedible.

Internal surveillance for pests like these is difficult if not impossible because of the abundance of their host plants in private and public gardens. It would be impossible to survey every garden for the presence of invasive species.



Black fig fly ovipositing in fig. Photo by Houston Wilson.



Grape leaf skeletonizer. Photo by Surendra Dara.



Giant sweetgum aphid masses on liquidambar tree trunk. Photo by Al Hom.



Cochabamba sp. beetle intercepted by US Customs & Border Patrol..



Salma brachyscopalis moth (Pyralidae) discovered in seed pods. Photos from US Customs and Border Protection.



Odd Insect Facts

Insects Are Now Fish

In a strange twist of legal fate, bees are now legally fish in California. In June of this year an appeals court ruled that bees, specifically bumblebees are now considered fish under the state's endangered species law. This act passed in 1970 was designed to protect native species and/or subspecies of bird, mammal, fish, amphibian, reptile or plant. It explicitly defined "fish" as a "wild fish, mollusk, crustacean, invertebrate, amphibian, or part, spawn, or ovum of any of those animals." It was used to protect not only fish species but also snails and

other invertebrates, but not insects.

In 2018 several public interest groups including the Xerxes Society, Center for Food Safety and the Defenders of Wildlife, petitioned the court to include four species of bumblebees as endangered species under the Act, including *Bombus crotchii*, *B. franklini*, *B. suckleyi* and *B. occidentalis*.

Then in 2020, Sacramento Superior Court ruled that "invertebrates" listed in the definition of fish only included marine invertebrates, and not insects, like bumblebees. Thus, the California Fish and Game Commission could not list invertebrates under the Act.

This year, in yet another legal twist the court ruled that "Although the term fish is colloquially and commonly understood to refer to aquatic species, the term of art employed by the legislature in the

Bombus franklini on California poppy.
Photo by Robbin Thorp.

definition of fish in section 45 is not so limited,".

As a consequence of this ruling, bumblebees would now be eligible for listing under the California Endangered Species Act.

Unfortunately, what may come as an unanticipated consequence of this ruling is that it fully opens the door for California Department of Fish and Wildlife to require permits, i.e. fishing licenses, for collecting insects in California.



Bee fish. Illustration by Slate, June 4, 2022.

Bug Smuggling

When we talk about the multibillion dollar illegal animal trade industry most people immediately think of birds and mammals. However, there is also a black market for insects and spiders.

A classic example of this was the recent discovery of a new genus and species of tarantula in Sarawak. Specimens of this tarantula were illegally collected and shipped to Europe for identification. After the specialist identified them as a new genus and species, the collectors started advertising the species for sale on-line for \$300 per juvenile. Oddly, one of the collectors claimed that they didn't have any captive spiders.

Sadly, this is a typical story. Illegal collecting is particularly hard on sedentary populations of insects and arachnids, like tarantulas, because the

burrows are destroyed by collectors and the populations tend to be small and isolated.

In the Convention on International Trade in Endangered Species (CITES), only three species and two subspecies of arthropods (all butterflies) are listed as threatened, but 36 species of tarantulas, 5 scorpions, 1 stag beetle and at least 8 species of butterflies are also listed as vulnerable, largely due to the pet trade. The vast majority of listed species are vertebrates. Yet, 97% of animals are invertebrates most of which are insects. The vast majority of vertebrates eat invertebrates to survive, so extinction of insect species can impact vertebrate survival.

A study by Fukushima et al. (2020)* demonstrated that the majority of



New species of blue tarantula from Sarawak.
Photo by Chien Lee, Science Magazine.

arthropods (largely crabs and related groups) are traded internationally as food. However, global trading patterns for other arthropods are largely untracked.

*Fukushima, CS, S Mammola, P Cardoso. 2020. Global wildlife trade permeates the Tree of Life. Biol. Conserv. doi: 10.1016/j.biocon.2020.108503

ASK THE BUG DOCTOR

If you have an insect question, need advice, want an identification of something you've found, or would like to see an article in the newsletter on a particular topic let us know. Email us at bmuseum@ucdavis.edu.

Insects and Pitot Tubes

Wasps and bees can have serious economic impacts on the aviation industry. It turns out that pitot tubes on aircraft that measure speed are just about the perfect diameter for nest building by solitary bees and wasps that use preexisting tunnels and cavities. We wrote about this in a previous newsletter but some airlines don't seem to learn. Six British Airways and one Virgin Atlantic aircraft had to abandon take-offs at Heathrow Airport this year because insects blocked the pitot tubes.



A keyhole wasp entering a hole. Photo by gailhampshire. Wikipedia.

Insect Sales on Amazon

An investigation by experts at Cornell University recently found that a wide diversity of insects and spiders, many considered rare and endangered are for sale on Amazon. They found the CITES listed peacock swallowtail for sale for about \$110. The most expensive insect they found was a birdwing butterfly for nearly \$4,000. Sadly, the rarer the insect becomes the more valuable it becomes

to collectors. Increasing the potential for the species to be completely decimated.



Papilio blumei.

Mosquito Problems

If you thought you had a lot of mosquitoes around your house, compare it with this. Light trapping mosquitoes over the summer of 2021 in one neighborhood on Sanibel Is. yielded enough mosquitoes to fill a 5-gallon bucket!



Mosquitoes from Sanibel Is. Photo from Lee County Mosquito Control District, Florida.

Washington Hornets



Sven Spichiger, of the Washington State Dept. of Agriculture, holding hornets vacuumed from a nest in a tree in Blaine, WA in 2021. Photo by Elaine Thompson, AP.

The state of Washington is continuing surveys to monitor for and capture any hornets that might have survived the winter. They've set about 1,000 traps since the beginning of the year, mostly in the northwestern corner of Washington state. To date there have been no confirmed nests found this year.

The Entomological Society of America is working to establish an official common name for this wasp. Murder hornet or Asian giant hornet are media names and not official ones.

Seafaring Termites

An international collaboration with the Evolutionary Genomic Unit at the Okinawa Institute of Science & Technology Graduate University revealed that the drywood termites in the family Kalotermitidae have crossed oceans at least 40 times over the past 50 million years. Analysis of the DNA from different populations and species revealed this bizarre history.

It makes perfect sense that termites inside logs being carried downstream into the ocean could do this. Although it seems surprising that they could survive for long periods inside wood floating across an ocean it is statistically probable over such a long period. For the termites it's like taking a long-term ocean liner trip with room and board provided...

New Japanese Beetle Infestation

Washington state seems to be the epicenter for several exotic species on the West Coast. In addition to worry about the giant hornet they have discovered Japanese beetles in Grandview and surrounding areas in central Washington. They are treating about 2,000 acres for the beetle. Last year they caught more than 24,000 Japanese beetles in the area!

Having this beetle establish in California would be catastrophic. The larvae feed in the soil on roots and the adults feed on foliage of a wide diversity of plants.



Japanese beetles feeding on a peach in Indiana. Photo by Zech Smith. Wikipedia.



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**Don't miss Dogface
Butterfly Day in the
Museum, July 16!**

