Bohart Museum Society

Fall 2024 **Newsletter** No. 100

In This Issue

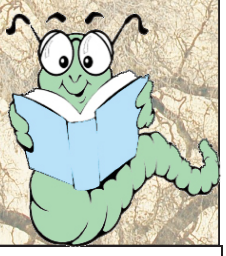
Wow, this is the 100th issue of the museum newsletter! It's hard to believe we've put out this many newsletters since I've been here.

Our last open house of 2024 will be held on November 2 from 1-4. We'll have talks on insect predators, and displays and sales of carnivorous plants.

Don't forget to RSVP for the Halloween party!

Our Spotlight on a Species this edition is particularly relevant in Davis. We joke about having five seasons in Davis: Winter, Spring, Summer, Fly and Fall. Fly season coincides with tomato harvest as houseflies breed in huge numbers in tomato fields which have been harvested and the remaining tomatoes left to be disced into the field.

-Lynn Kimsey



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SPOTLIGHT ON A SPECIES

Insects, Food and Disease

by Lynn Kimsey



Mating houseflies. Photo by Kathy Keatley Garvey.

Insects may be some of the cleanest animals we know of, yet they are implicated in a wide variety of diseases in humans and other animals. We always focus on obvious pathogen vectors like mosquitoes, yet houseflies and cockroaches might be even more dangerous, not because they transmit pathogens via blood-feeding but because they are attracted to food and feces. This makes them excellent mechanical vectors and important reservoirs for pathogens, such as *Bacillus cereus*, *Salmonella enterica*, *Shigella dysenteriae*, *Staphylococcus aureus*, *Rotavirus*, *Aspergillus fumigatus* and *Cryptosporidium parvum*. Food makes the perfect delivery mechanism for these organisms. Food borne illnesses are probably responsible for the vast majority of human deaths globally. Many deaths, attributed to insect transmitted diseases such as malaria and dengue, may actually be caused by food borne pathogens.

A number of cockroaches are considered peridomestic because they are found living in and around human habitations and may not even occur in wildlands anymore. In the Americas, all of the peridomestic cockroaches, such as the American, German or brown-banded cockroaches, originated on other continents. Ironically, the American cockroach originated in western Africa, as did the brown banded cockroach. Both were probably transported into the Americas by the slave trade. The German cockroach originated in southern Asia (!).

American cockroaches became associated with humans and human habitations thousands of years ago. They are particularly effective in indoor transmission, because they visit bathrooms for water and kitchens for food. This makes them pathogen taxis from toilets to food preparation areas. The presence of indoor cockroaches in homes is



Philadelphia Department of Health poster warning the public of housefly hazards, circa 1942.

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Museum News

New Exhibits







Octopus sculpture created by Allen Chew (left). Box containing cicada skins from Dan Young (above).

Two colleagues, Alfred Daniel Johnson from Tennessee State University and Daniel K. Young from the University of Wisconsin, came through. Each of them sent us the equivalent of a lunch bag filled with hundreds of cicada skins.

Undergraduate Allen Chew used his imagination to create an incredible sculpture of an octopus using the skins. The sculpture is roughly 11 inches long 8 inches wide and 6 inches tall. He carefully separated the abdomen from the thorax using the thorax for the legs and the abdomen for the rest of the body. It's now on display in one of our hallway display cases.

Two cicada broods, Brood XIII and Brood XIX, emerged nearly simultaneously this year. After we heard about the emergence of these broods in the eastern U.S., we put out a call to the Entomology Collection Network to see if we could get cicada skins.

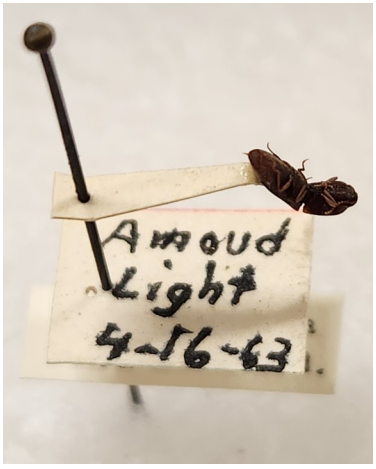
"Don't Do This at Home" Archive

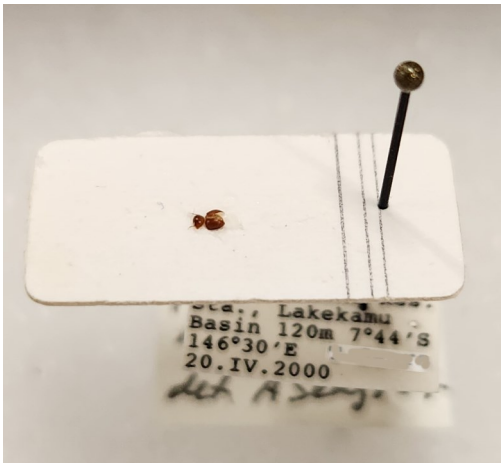
Museum staff have begun compiling images of badly mounted specimens to use for training students and for general entertainment. Ultimately, we are planning to do a website showing correct and incorrect mounting techniques for insects. These range from very large point-mounted insects that should have been pinned, glued to huge hand-cut points on sewing needles, to tiny beetles squashed onto large paper cards.

If you have any favorites that you've found, please send us images to bmuseum@ucdavis.edu.



Net-winged beetle (Coleoptera: Lycidae) glued to oversized point and pinned with sewing needle. Photo by Andy Deans (CC BY 2.0).







MUSEUM EVENTS

ABC's of Collecting Open House

Our September 28th open house focused on how to curate: collecting techniques, specimen handling, and preparation. It was a great success. We had more than 300 visitors and about 20 volunteers who helped set up, greet, and talk to visitors. Demonstrations included microscopy, searching for scorpions with blacklights, suction and trapping tools, and nets. In addition, a group of students demonstrated curation techniques, pinning, point mounting, and labeling specimens.



Thea Schmidt using the UV light to look at the scorpions. Photo by Kathy Garvey.



New leaf insect origami from Ken Murakoshi (right).



Steve Heydon demonstrating collecting techniques and equipment to open house visitors. Photo by Kathy Garvey.



Sutton, Elliot, and their mother, Candice Sauder looking an insect through the microscope. Photo by Kathy Garvey.

Richard M. Bohart (1913-2007)



Portrait of Richard M. Bohart circa 1980 (left).



Cake celebrating Bohart's 111th birthday this year (below).

Richard M. Bohart (Doc), the first director of the Bohart Museum and our namesake, would have turned 111 this past weekend on September 28. We celebrated in the museum with a cake in his honor at the open house on museum techniques.

Prof. Bohart spent most of his life in California. He was born in Palo Alto. He began his entomology career, like so many of us, collecting butterflies as a child in the hills around the San Francisco Bay Area.

He did his Ph.D. at UC Berkeley where he wrote his thesis on Strepsiptera (twisted wing parasites). He completed his thesis in 1939 and took a research and teaching job at UC Los Angeles studying sod pests.

In 1942 he was drafted into the US Army and was transferred into the US Navy Medical Corps. He was trained in mosquito biology and was then sent to Guam and then Okinawa for a malaria control program.

In 1946 he was released from the Army, returned to UCLA, and then transferred to the newly established University of California research facility at Davis that would eventually become UC Davis.

He served as department vice chair and chair of Entomology at UC Davis between 1957 and 1967.

Through his teaching and mentorship Doc trained a generation of highly talented insect systematists who held positions in major museums, including the U. S. National Museum of Natural History and the Bohart Museum of Entomology.

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American cockroaches. Photo by Kathy Keatley Garvey.

not particularly concerning because the microbes derive from the residents, but it's a very different situation in commercial kitchens, such as restaurants, where cockroaches can readily move between restrooms used by a wide variety of visitors and the food preparation areas.

The presence of cockroaches in a commercial kitchen is a critical health code violation, and one of the most important indicators of unclean conditions. In commercial settings, cockroaches visit bathrooms for water and food preparation areas for food. This means that they can transport potential pathogens onto food preparation surfaces. Generally, if a cockroach is observed during daylight, it is an indication of a potential infestation, as cockroaches are nocturnal and their presence during the day is indicative of a large population forcing individuals to forage for food in the daytime.

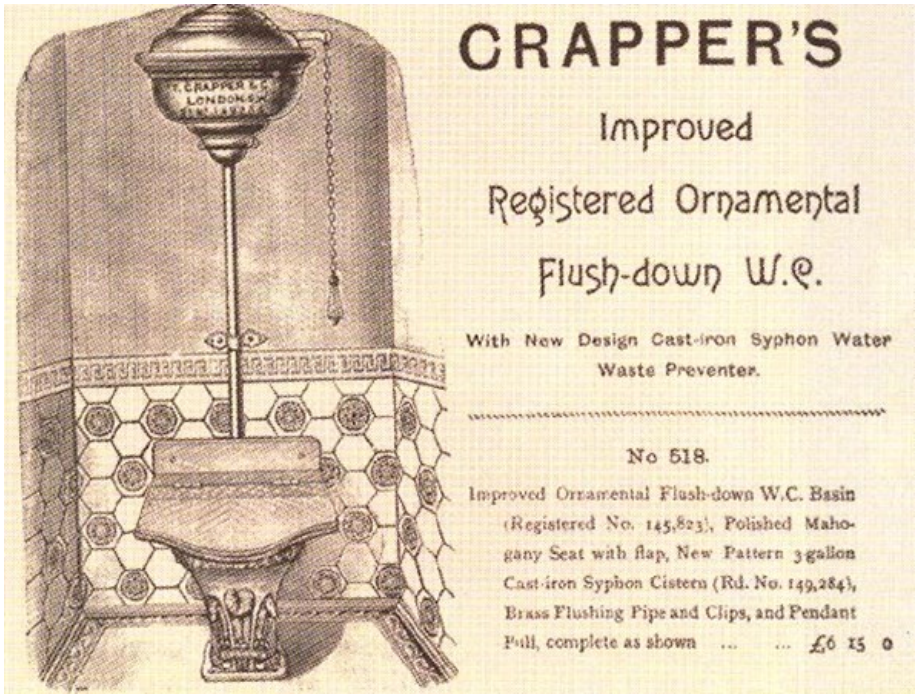
Cockroaches vector pathogens on the outside of their bodies via contamination and not through their feeding activities or fecal material. Cockroaches constantly groom, cleaning their antennae frequently. This is essential to keep their sensory organs clean and functional. However, if they are walking over contaminated surfaces followed by food preparation areas, they can still mechanically transmit pathogens.

Houseflies are even more closely associated with humans than cockroaches. They are linked to horses and horse manure where their larvae develop in central Asia. This relationship is probably thousands of years old. As humans moved horses across the globe, they also moved houseflies.

Unlike cockroaches, houseflies have licking/slurping mouthparts. Consequently, they can only feed on liquified foods. They can liquify solid foods, like fecal material, by using enzymes in their saliva or regurgitating their stomach contents, including materials they fed on previously. These flies also feed on human food and fecal material of all kinds. This feeding behavior means that they can readily transport pathogens from fecal material to human food. Because of their close association with humans and vector abilities, they are probably responsible for major human deaths over the centuries. Many, if not most deaths attributed to malaria, dengue and other insect vectored diseases in developing countries, particularly in Africa, are probably caused by pathogens vectored by houseflies.

Several famous inventions that we now take for granted were developed that protected people from houseflies, including indoor toilets and window screens. Indoor toilets were particularly important because outdoor privies are way too easy for houseflies to access, and the great diversity of bacteria and other pathogens too readily available. One of the first patents for an indoor toilet was given to Thomas Crapper, thus the origin of the colloquialism "crap". Moving toilets indoors made access more difficult, but to fully protect people from house flies barriers to prevent fly access were essential.

Window screens originated in the United States. In the mid 1800's Gilbert, Bennett and Co. manufactured wire mesh screens for use in food processing. In 1868 a patent was filed for screening roof-top rail car windows to prevent debris like sparks and cinders from blowing into passenger compartments while still allowing ventilation. By the mid 1870's, wire mesh screens were being sold by the square foot and were being used on windows in homes and businesses. Window screens proved to be a highly effective way to separate food storage and preparation areas from house flies, and by the 1950's insect borne parasitic diseases were essentially eradicated in the United States.



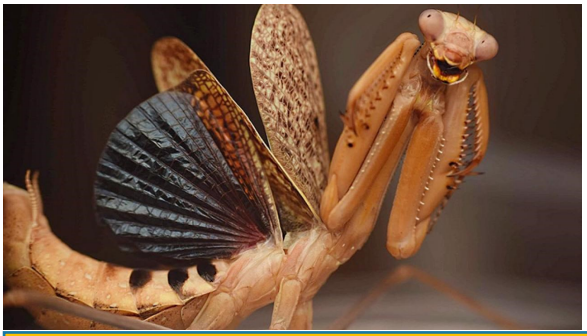
Advertisement for Thomas Crapper's toilet invention.

Insect News

New Mantis Discovered



Lohitash Garikipati (left). New mantis species, *Stagmomantis clauseni* (below)



Former UC Davis student and Bohart Museum employee, Lohittashwa (Lohit) Garikipati, has long been an avid student of mantises. He is currently a doctoral student in the Richard Gilder Graduate School at the American Museum of Natural History.

Lohit was 9 years old when he discovered Mantidforum.net, a site for mantis information and enthusiasts. He became obsessed with mantises and has been studying these fascinating insects ever since.

Mantidforum, founded by Peter Clausen, is a great resource for mantis information and rearing, as well as a place to connect with other enthusiasts.

Clausen moved from Oregon to southern Arizona where mantis diversity was much higher. Clausen sent Lohit images of mantises he would find in Arizona for Lohit to identify.

One in particular, collected in Madera Canyon, caught Lohit's attention. He had collected a juvenile specimen but no adults. Clausen collected another and sent the specimen to Lohit. It turned out to be an undescribed species. He named it in honor of Clausen, *Stagmomantis clauseni*. The common name for this mantis is the Sonoran tiger mantis.

Horse Guard Wasp



Stictia carolina female. Photo by N. Dell, BugGuide.

It turns out that a solitary native wasp in the eastern United States is providing unusual but effective biological control of horseflies around livestock.

The horse guard wasp, *Stictia carolina*, is a large, brightly marked, black and yellow wasp in the family Crabronidae.

The genus *Stictia* is primarily found in tropical America with only three species reaching the U.S., all east of the 100th meridian. It nests in compacted sandy soil. The nests consist of a simple burrow 7 or 8 inches deep.

Stictia females primarily provision their nests with horseflies. However, they have also been recorded preying on stratiomyids, screwworm flies, cicadas, skipper butterflies, and even a large bodied mosquito (*Psorophora*).

This large wasp builds simple nests in the ground. Each female makes her own nests and each nest is built to house a single egg. Each nest is provisioned with 30-60 horseflies to feed the developing larva.

The female grabs the horsefly and stings it to paralyze it. She then carries the fly upside down beneath her body using her middle and hindlegs.

Males are not involved with the nests, but engage in a variety "sun dances", courtship behaviors, and nuptial dances to attract females.

Huge numbers of nests, with thousands of individual wasps, can be found in the vicinity of livestock in parts of the eastern U.S.

The large number of horseflies taken for each nest make these wasps important biological control agents for horseflies. If each female takes say 50 flies per nest and makes 5 nests, that's 250 flies per female. If you then consider these large nest aggregations where there might be more than 100 nests in a single area, the females are taking 5,000 flies!



Stictia carolina taking a horsefly into her nest. Photo by H.E. Evans, Colorado State University. Courtesy of Bugwood.org.

MORE MUSEUM NEWS

Updates on the Delta Project

Delta Survey

The Delta survey project funded by the CA Dept. of Water Resources continues. To date, we've identified 245 species in 10 insect orders. The principle limitation with this project is finding specialists to identify some of the insect groups. We've also been making comparisons between one of the sites, Dutch Slough, which has been partly restored with native plants, with the Antioch Dunes Preserve found further west. The Antioch Dunes are/were(?) home to a number of rare species including Lange's metalmark butterfly. So far about 6% of the species we've collected at Dutch Slough are shared with the Antioch Dunes.

To date, we've identified 574 species from the combined sites, with the majority from Delta sites like Dutch Slough where there have been extensive efforts by the CA Dept. of Water Resources to restore native vegetation.



Lange's metalmark. Photo by Greg Kareofelas.

Delta Project Ramble

By Rex Nepstad*

What truly impresses me about entomology is just how many insects there are, even in the most mundane looking of habitats. Case in point: the Delta Project. Each location is surrounded by brand-new subdivisions, pesticide-rich farmland, or, in the case of Sherman Island, a barge situated commune. Sure, insects are definitely *there*, but even the most vegetated Delta location has a limited number of insects to the untrained eye. Walking around, the most apparent insects are garden variety honeybees, harlequin bugs, and oh-so-many damselflies. Maybe there are some katydids on branch tips, some sulphurs on the wing, or some (admittedly cool) sand wasps digging about, but nothing really leaps out, excluding the lagomorphs. Net collecting, even by the most seasoned entomologist, will only reveal so much biodiversity. Put out some traps, however, and the expansive array of insects is astounding.

The first glance at any given trap sample, be it malaise, blue vane, or UV bucket, is usually disappointing: 85% of the insect mass is invariably some kind of medium-sized riparian fly or beetle that emerged en masse during the trapping period. Under the microscope, however, there is an entirely new dimension, one dominated by the ridiculous biodiversity of minuscule parasitoid wasps. There are probably more species of these wasps per trap site than there are species of birds in the entire state. Excluding parasitoids and their frequently bizarre morphology (looking at you, Leucospidae, with your backwards ovipositors), every order has something interesting to contribute. Hundreds of species of flies, many of which would go unnoticed by the naked eye. A few dozen hemipterans, half of which are Miridae with their legs falling off. The eccentric wing venation of barklice, with more loops and curls than a Dr. Seuss cartoon. Numerous tiny beetles, all of which are cute, all of which are arduous to point mount. There are many honeybees, innumerable indistinct brown moths, and the occasional amphibian crusader. Every day is different, every trap is different, and it is all fascinating.



Container ship going by Twitchell Island. Photo by LS Kimsey.

The Delta Project has given me a completely new perspective, not only on the rampant biodiversity of insects, but also their various peculiarities. Why do Western Tiger Swallowtails wedge themselves through the narrow openings of blue vane traps to meet a 200-proof ending? Why do cuckoo wasps die curled up like an isopod, whereas leafcutter bees die with their abdomens flipped upwards? Why must diminutive weevils fold their legs so tightly that proper point mounting becomes a gymnastic trick? Whatever curiosities there may be, I enjoy them - they make the daily humdrum of point mounting ten thousand flies, all of which may blow off the table if you exhale slightly, delightful. I came to UC Davis as a butterflies-and-nothing-else entomologist, and I will leave it with a vastly expanded knowledge of every order except the Trichoptera. Science gets a thorough biodiversity survey on insects in a heavily altered region of California, while I gain experience and knowledge, so everyone wins. And the biodiversity of insects in mundane-looking habitats? Practically immeasurable!

*Rex Nepstad is an Entomology major at UC Davis and works in the Bohart Museum.

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.

Box Tree Moth



Adult box tree moth. Photo by Szabolcs Sáfián, University of West Hungary, Bugwood.org

The box tree moth, *Cydalima perspectalis* (family Crambidae), is native to eastern Eurasia, and has been found in the eastern U.S., where it is a pest of boxwood trees (genus *Buxus*).

New Wasp Species



Heydenia collected and imaged by Corwin Parker.

Corwin Parker, former UC Davis student, at the Oregon Department of Agriculture, recently discovered a a brightly colored pteromalid wasp in the genus *Heydenia* (named after Steve Heydon) in a bark beetle trap in Klamath County, Oregon. Species in this genus are know to be parasitoids of bark beetles.



Emerald Ash Borer. Photo by the Pennsylvania Dept. of Conservation & Natural Resources.

Emerald Ash Borer

Most of our pest insects are boringly colored in browns and greys. However, a new beetle pest that's reached the East Coast from Europe is causing significant damage to ash trees (genus *Fraxinus*). The emerald ash borer, *Agrilis planipennis,* is a small metallic green buprestid. The larvae feed under the bark of ash trees.

Bedbug Surprise



A Detroit library got a big surprise when someone returned a DVD with a bedbug inside. At least that's what library staff thought. Actually, it turned out to be a cockroach...

Asian Hornets

Asian hornets, *Vespa velutina*, have invaded the United Kingdom, with nests found in 56 different locations. Most have been found in Kent, spawning fears that the wasps will seriously impact honey bee colonies and other native insects.



Vespa velutina nest. Photo by Georgia Dept. of Agriculture

Eastern Equine Encephalitis



Cattail mosquito, *Coquillettidia pertubans*. Photo by David McCorquodale. iNaturalist Canada user: dbmcc09.

Eastern equine encephalitis (EEE) is a virus that normally infects horses, but a New Hampshire man recently died from the disease. This appears to be at least partly linked to the spread of this and other viruses in local mosquito populations, particularly *Culiseta melanura* and *Coquillettidia perturbans*.

Endangered Firefly



Bethany Beach firefly. Photo courtesy of Getty Images.

Because the Bethany Beach firefly is rare and only found in the coastal areas of Virginia, Maryland, and Delaware in the U.S. Fish and Wildlife Service is proposing to list the species as endangered. It is unusual because they have a distinctive double green flash. They were first discovered in the 1950s.

Crazy Wasp



Photo by Rousse, Broad and van Noort, 2016 (https://zookeys.pensoft.net/issue/986/).

South African ichneumonid crazy wasp, *Genaemirum phacochocerus,* head.



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Don't miss the
November 2 open house on
Predators of Insects

