

## Introduction: Exotic pests

California's prominent position on the Pacific Rim, favorable climate, popularity among tourists and abundant agriculture make it particularly vulnerable to exotic pests. A new exotic pest threatens the state's agricultural, natural and urban environments every 60 days.

Agricultural pests, such as the tiny but destructive silverleaf whitefly, are expensive neighbors; the whitefly has cost California agriculture \$1 billion since 1991. Urban pests can be equally devastating. Now believed to be established in San Diego County, the Formosan termite could cost 1% of the total value of wooden structures throughout the state.

With its mandate to prevent the entry and establishment of harmful exotic pests, CDFA's monitoring and eradication efforts are also significant. In the past 4 years, for the Mediterranean fruit fly alone, these efforts have cost an

estimated \$131 million, shared equally by state and federal government.

In the research articles that follow, UC scientists present the current scientific thought on a number of major exotic pests. We begin with three brief news articles, including a look at the UC Center for Exotic Pest Research (CEPR).

By focusing exclusively on exotic pests, the CEPR fills a specialized niche within the university. CEPR is distinct from UC's Center for Pest Management Research and Extension, which serves as a statewide clearinghouse of information and coordinator of research. It is also distinct from the Statewide Integrated Pest Management Project, which develops IPM strategies for established agricultural pests. —Ed.



**Mediterranean fruit fly, a continuing concern in California.**

## Center for Exotic Pest Research tackles controversy

Discoveries of Mediterranean fruit flies in Southern California in 1993 and 1994 led to the threat of a Japanese trade embargo, public outcry over malathion spraying, and heated scientific debate over the establishment of the pest.

This crucible of public and scientific controversy would lead to the formation of the UC Center for Exotic Pest Research (CEPR) in September 1994. In November 1994, the center brought together more than 40 internationally renowned scientists to discuss medfly research. They emerged with a consensus report embraced by the U.S. Department of Agriculture (USDA), the California Department of Food and Agriculture (CDFA), and UC scientists.

CEPR continues to play an important research and extension role in dealing with exotic fruit flies. In 1998, CEPR will assist in evaluating the medfly sterile insect technique and in improving the release program. Research conducted with USDA in Hawaii and at the Los Alamitos sterile release facility will focus on rearing methods, quality control, and longevity and fate of sterile flies released in California. Scientific evaluation of the program is particularly crucial because of recent medfly finds in Walnut Park, which have sparked debate.

Another contentious issue tackled by CEPR, based at UC Riverside, is the impact of newly liberalized trade policies on the introduction of exotic pests. CEPR was asked to review a proposed rule by the USDA's Animal and Plant Health Inspection Service (APHIS) allowing importation of fresh Mexican Hass avocados into the United States. A risk assessment published by CEPR found the proposed rule and the work plan submitted by Mexico provided ineffective safeguards for the protection of California agriculture from a number of exotic pests. CEPR's intercampus team of UC scientists further concluded that APHIS had been forced into a conflict of interest when they were asked to facilitate international (import) trade while attempting to maintain its historic mandate of preventing the introduction and establishment of exotic pests.

In February, the Subcommittee on Trade of the House Ways and Means Committee held hearings to examine U.S. efforts to reduce trade barriers in agriculture. CEPR director Joseph Morse testified, in part, "The movement of nonindigenous pest species throughout the world will be accelerated by new free trade agreements such as NAFTA and GATT . . . California, with the largest agricultural industry, the greatest crop

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diversity, the largest population, and the most extensive tourism industry, has more at risk than any other state in the U.S." CEPR urged Congress to increase funding for research on exotic pests and to reexamine the role that APHIS plays in protecting U.S. agriculture from foreign invaders.

A major aim of CEPR over the next several years will be to help coordinate joint efforts by

USDA, CDFA, the agricultural industry and university researchers in fighting exotic pests that have been, or could be, introduced into the state. Other major problems on the horizon include the spread of rice blast, a fungal disease of rice in the Sacramento Valley and the arrival of destructive fire ants in Kern County almond orchards.

— Cindy Giorgio

## Silverleaf whitefly extends range



The silverleaf whitefly has extended its range from the Imperial Valley into the San Joaquin Valley, where it has become a pest of cotton in areas where there is a high concentration of both cotton and citrus. "We have found silverleaf whitefly as far north as Merced County," says UC entomologist Charles Summers.

The agricultural commissioner's office in Imperial Valley reported a \$111 million crop loss in 1991-1992. Now that growers have adjusted to the pest, that kind of crop loss should not occur again, but the big cost is in pesticides. The melon crop probably uses the most pesticides. Melon growers apply pesticides two to five times per season. In 1996, Imperial County growers spent roughly \$12 million to protect 49,442 acres of melons from silverleaf whiteflies.

UC scientists and state Department of Food and Agriculture (CDFA) scientists are cooperating in battling the expensive pest. UC's Summers is tracking the movements of silverleaf whitefly, while CDFA entomologist Charles Pickett is researching the prospects for biological control of the pest.

Summers, who is based at the UC Kearney Agricultural Center in Parlier, is investigating the role of citrus and weeds in the spread of silverleaf whitefly. In 3 years, from 1993-1996, he witnessed whiteflies escalate from zero to 1,000 eggs per orange leaf.

"These infestations were initiated in 1994 from eggs laid on the fall flush of citrus leaves by adults migrating from cotton following defoliation," Summers explains. "Silverleaf whitefly survived the winters of 1994-95 and 1995-96 in all life stages on citrus."

During the late summer and early fall of 1996, there was an unprecedented migration of

silverleaf whitefly adults into citrus in eastern Tulare County. In a survey conducted in September 1996, Summers found populations of silverleaf whitefly nymphs were high enough to leave large quantities of honeydew on the fruit.

"Silverleaf whitefly has become adapted to citrus over the past 3 to 4 years and is currently a year-round resident," he says.

CDFA entomologist Charles Pickett is investigating the role that parasitoids may play in controlling silverleaf whitefly. The USDA collected and screened parasitoids from different parts of the world. Pickett has released large numbers of these exotic parasitoids into citrus and other crops where silverleaf whitefly overwinters in the Imperial and San Joaquin valleys. He hopes to increase the number of the whitefly's natural enemies. "We have one native species of *Eretmocerus eremicus* and two species of *Encarsia* that didn't do much," he explains. "We're trying to increase their diversity. The different parasites may perform better in some crops than others because every type of plant represents a different habitat.

"We have three or four that look promising; they've persisted over a year, maybe 2 years in some locations," Pickett says. The new species of *Eretmocerus* collected in Spain, Pakistan and the United Arab Emirates are in the process of being described so they don't have official names.

"Our long-term goal is to reduce the whitefly in noncrop situations — urban areas and along margins and perimeters of fields. If we can do that, it may reduce regional populations and the frequency of pesticide applications may drop."

Applying parasitoids instead of pesticides to fields may be another alternative for growers. Pickett has also experimented with biocontrol by augmenting with parasitoids mass-reared at CDFA's biological control greenhouse facility in Sacramento and with the USDA-APHIS in



Scientists are testing the effectiveness of parasitoids for silverleaf whitefly control. Top, an *Encarsia pergandiella* lays its egg in a silverleaf whitefly nymph. Above, whitefly nymphs parasitized by *E. pergandiella* and *Encarsia luteola*.