

# Review of pest flies (Diptera: Tephritidae, Drosophilidae) detected in California from 2004 to present

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Detections of pest Diptera from 2004 to present are mapped and reviewed, mainly tephritid fruit flies, but with the exception of the recent introduction of a species of drosophilid vinegar fly which is highlighted in some detail. Overall, these flies feed on more than 250 kinds of fruit, resulting in spoilage and making fruit unfit for consumption. California is in a constant state of alert for fly finds, because they can cause enormous amounts of damage to California and US agriculture. In any given year, more than 100,000 detection traps are deployed during peak season, using 5 primary lures and 3 different trap types.

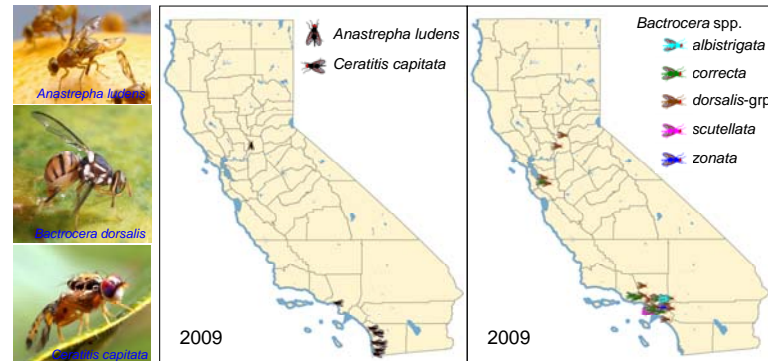
## Tephritidae

2009 has been a particularly difficult year for fruit flies. Although a light year for *Anastrepha* (only one detection, in August – Mex fly, *Anastrepha ludens*), it has been a heavy year for both Med fly (*Ceratitis capitata*) and *Bactrocera* species.

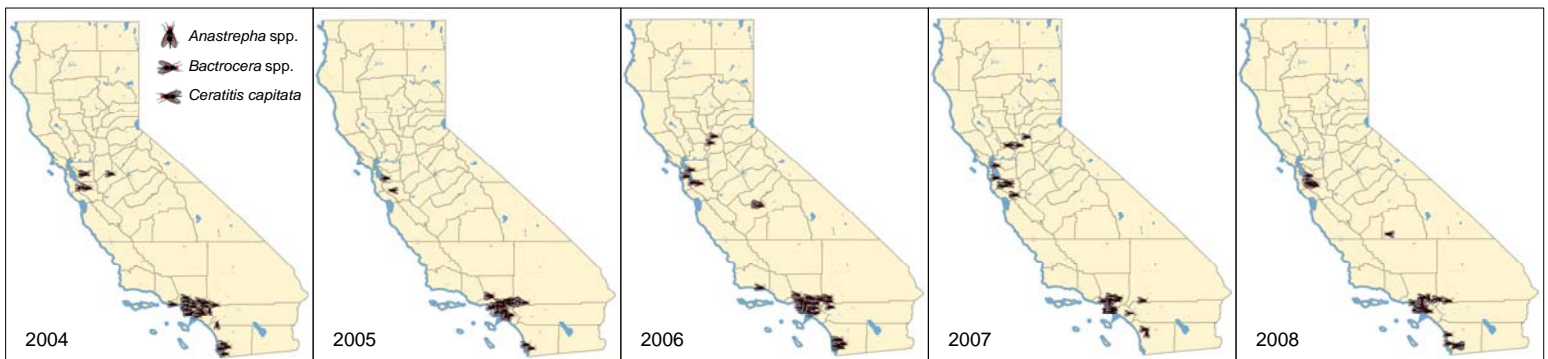
For Med fly, there were detections in each month except January, April and August (and December so far), with a total of 8 wild males, 3 unmated females and 10 sexually mature and mated females, in addition to 3 larval properties totaling 93 larvae. All of these detections have been in San Diego County, except for 1 in Los Angeles County in October. All detections of Med fly this year had the AAAB mitotype, which is consistent with populations distributed in Central America and most previously recorded detections in Southern California. Populations of this type are also known from Africa and the Mediterranean Region.

For *Bactrocera* species, there has been an unusual high diversity this year, with 5 species detected (not including *Bactrocera oleae*, which is established in California). Among these was the first New World record of *Bactrocera albistrigata* (white striped fruit fly), detected in Los Angeles County, with a total of 6 males and 2 females (of which 1 was mated), all in July. In addition, a species that has not been detected in California for more than a decade has reared its head again. After the April detection of *Bactrocera scutellata* (striped fruit fly) in Los Angeles County, a total of 9 males were detected through May. A surprise came in mid-November, with the detection of a single female, also in Los Angeles County.

For *Bactrocera correcta* (guave fruit fly), 16 males have been detected in total. Of these, 7 were from Orange County, collected in July; 6 were from Los Angeles County, collected in April, June, August and September; and 1 each was collected in Ventura County (August), Santa Clara County (September) and San Mateo County (November). For the *Bactrocera dorsalis*-group (Oriental fruit fly complex), 23 males and 2 females (both in July from Los Angeles County, of which 1 was mated) have been detected each month from June through October, inclusive. Los Angeles County was hardest hit, with detections in each of these months. In July, the most different counties were hit, with 1 in Alameda County, 2 in Orange County, 1 in Riverside County and 2 in San Bernardino County. Sacramento County had 4 detections – 1 in July and 3 in August, while Santa Clara County had 1 in October. For *Bactrocera zonata* (peach fruit fly), 1 male was detected in August in Orange County.

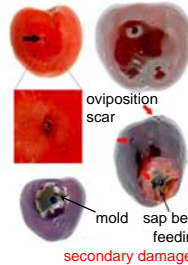


The following fruit flies have been detected from 2004-2008 and are reflected on the maps below: *Anastrepha ludens* (all years), *Anastrepha obliqua* (West Indian fruit fly) (2004; 2005), *Anastrepha suspensa* (Caribbean fruit fly) (2004), *Bactrocera correcta* (all years), *Bactrocera cucurbitae* (melon fly) (2004; 2006), *Bactrocera dorsalis*-group (all years), *Bactrocera zonata* (2006; 2007), *Ceratitis capitata* (all years except 2006). For *Ceratitis capitata*, the following mitotypes were determined: 2004 (AAA-), 2005 (AAAB, AAB), 2007 (AAAB, AAB, BBB), 2008 (AAAA, AAAB). Going back to 1998, the following additional species have been detected: *Anastrepha striata* (no common name), *Bactrocera facialis* (no common name), *Bactrocera latifrons* (Malaysian fruit fly), and *Bactrocera oleae* (olive fruit fly; since established in the State).



## Spotted-winged Drosophila

In September of 2008 the PPDC received a sample of a drosophilid fly from Santa Cruz County, collected in a raspberry field. It was identified as a *Drosophila* sp., but because drosophilids are very commonly submitted in the Fall months in association with rotting fruit, it was categorized as a harmless species. What was not clear from the submitted specimen was that fresh raspberries and strawberries were infested with these larvae, causing serious damage in this area.



In the Spring of 2009 the PPDC received several samples of maggots found in otherwise healthy cherries, with western cherry fruit fly (*Rhagoletis indifferens*) being the main suspect. This was a great concern to local farmers, because this fruit fly is not known from that area. The submitted larvae were clearly drosophilids and it was still assumed that they were only secondary invaders, and that the primary damage had a different cause. But after more and more reports of massive infestations in cherries came into the lab and the only larvae submitted were *Drosophila*, we suspected that the normally harmless *Drosophila* might be the primary cause. Unfortunately there were only larvae submitted in alcohol and identification of immatures is not possible to the species level in this family. Despite trying to match gene sequences (COI) with sequences in the GenBank and BOLD databases, the results were inconclusive at the species level, only confirming that they were *Drosophila*. As it turned out, there were no sequences in these databases for *Drosophila suzukii*.

In the meantime many samples came in from Santa Cruz County and the cherry growing areas of the Central Valley. Finally the lab received adults and the species could be identified by morphology, turning out to be the Asian species *Drosophila suzukii*.



With a species name on hand, several accounts of damage by this fly could be found in the literature, particularly from Japan. In Japan the flies seem to have a preference for cherries and blueberries. The species was also known from Korea, Thailand and India, with the Asian host list also including grapes, Japanese apricots, mulberries, raspberries and strawberries. The species reported in Hawai'i in 1980, and has since spread to several of the islands despite having little effect on crop plants. In the Fall of 2008, the species was also reported from Spain, so far with no reported damage. Since its first detection in California, this species has been found in 27 counties, as well as in Oregon, Washington, British Columbia, and Florida. The main host in California is cherries, but there are confirmed reports from raspberries, strawberries, boysenberries, plums, Asian plums, nectarines, plumcots, Satsuma plums and blackberries. Amy Dreves recently reported *D. suzukii* from wine grapes in Oregon. Because this species can also feed in decaying fruit (the more typical substrate for *Drosophila* species), combined with the typical high fecundity and short generation time, this small fly has a high potential to become established and widely distributed.

