

*Ceratitis capitata* 

**System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Diptera	Tephritidae

**Common name** medfly (English), Mediterranean fruit fly (English)

**Synonym** *Trypeta capitata* , Wiedemann, 1824  
*Paradalspis asparagi* , Bezzi  
*Ceratitis hispanica* , De Brême  
*Tephritis capitata* , Wiedemann  
*Ceratitis citriperda* , MacLeay

### Similar species

### Summary

*Ceratitis capitata* is considered a major tephritid fruit fly pest of economic importance attacking more than 300 different hosts, primarily temperate and subtropical fruits. The medfly as it is commonly called has invaded many countries and caused major economic losses for fruit farmers. *C. capitata* has the ability to tolerate cooler climates better than most other species of fruit flies. It lays its eggs under the skin of fruit, usually around already broken skin. Due to this reproduction habit, *C. capitata* thrives in agricultural areas where fruit is left out and becomes damaged. It spreads to new locations via exports and the local sale of fruit that contains eggs.



[view this species on IUCN Red List](#)

### Species Description

The adult medfly is 4 to 5mm [1/6 to 1/5 inch] long, (about two-thirds the size of a housefly). The general colour of the body is yellowish with a tinge of brown, especially the abdomen, legs, and some of the markings on the wings. The oval shaped abdomen is clothed on the upper surface with fine, scattered black bristles, and has two narrow, transverse, light coloured bands on the basal half. The female can be distinguished by its long ovipositor at the apex of the abdomen. The larval phase consists of three instars. The size of the larvae depend on their diet. The larvae are typically elongate, cream coloured, cylindrical maggot-shaped. Their anterior end narrows and is somewhat recurved ventrally, with anterior mouth hooks, and a flattened caudal end. The length of the first larval stage is 1mm [1/25 inch] or less, and the body is mostly transparent; the second larval stage is partially transparent with the fruit in the gut visible; the fully grown third larval stage is 6 to 8mm [1/4 to 1/3 inch] long, with a body fully opaque white or the colour of ingested food. The pupae are cylindrical, approximately 3mm [1/8 inch] long, and dark reddish brown in colour (Mau and Kessing, 1992). Please see PaDIL (Pests and Diseases Image Library) Species Content Page [Mediterranean fruit fly](#) for high quality diagnostic and overview images.

## Lifecycle Stages

Larvae begin feeding almost immediately after hatching. Tunnels are formed, but the larvae often feed together in the same vicinity until they are nearly fully grown. Larvae pass through three larval stages (instars) before they emerge from the fruit.

They may emerge in large numbers just after daybreak and pupate in the soil or whatever is available. Minimum duration of the pupal stage is 6-13 days when the mean temperature ranged from 24-26 C [76-79 F]. Pupae usually develop in soil an inch or two below the surface.

Adults emerge from the pupal cases in large numbers early in the day during warm weather and more sporadically in cooler weather. Females usually die soon after they stop ovipositing. The length of time required for *C. Capitata* to develop from egg to adult is about 21-30 days under tropical conditions. According to Thomas *et al.* (2001), "adults die within four days if they cannot obtain food. Usually about 50% of the flies die during the first two months after emergence. Some adults may survive up to six months or more under favourable conditions of food (fruit, honeydew, or plant sap), water, and cool temperatures. When host fruit is continuously available and weather conditions favourable for many months, successive generations will be large and continuous. Lack of fruit for three to four months reduces the population to a minimum."

Modelling of medfly dispersal distances done by Meats & Smallridge (2006) found that the majority (90%) of medflies displaced only 400 – 700m.

## Habitat Description

Medfly has the ability to tolerate cooler climates better than most other species of fruit flies (Mau and Kessing 1992). Thomas *et al.* 2001, state that some adults may survive up to six months or more under favourable conditions of food (fruit, honeydew, or plant sap), water, and cool temperatures.

Broughton & De Lima (n. d.) state that "In winter, the [Med]fly may become inactive in cold areas. Medfly can overwinter as adults, as eggs and larvae (in fruit), or as pupae in the ground. Adult Medflies are active in winter when temperatures exceed 12 °C." They also recommend that any control methods should begin in Spring, as the temperature increase allows overwintering flies to become active, to prevent population sizes from increasing rapidly to problematic levels.

## Reproduction

Newly emerged adults are not sexually mature. Males often show sexual activity four days after emergence, and copulation which can occur at anytime has been observed five days after emergence. Most females are ready to mate from 6 to 8 days after emerging from the pupa. Eggs are very slender, curved, 1mm [1/25 inch] long, smooth and shiny white. They are deposited under the skin of fruit that is just beginning to ripen, often in an area where some break in the skin has already occurred. Several females may use the same deposition hole with 75 or more eggs clustered in one spot. Each female will deposit 2 to 10 eggs. Eggs hatch in 1.5 to 3 days in warm weather. Females lay 1 to 10 eggs in a cavity 1mm [1/25 inch] deep. She may lay as many as 22 eggs per day and as many as 800 eggs during her lifetime (usually about 300) (Mau and Kessing, 1992). *C. Capitata* has the highest net reproductive rate of four species of tephritids (which are ecologically very similar) which currently inhabit La Réunion (Duyck *et al.* 2007).

## Nutrition

The medfly is known to attack over 300 different hosts, primarily temperate and subtropical fruits (Liquido *et al.* 1991 ). It is thought that in the absence of control, in Western Australia, "Medfly would infest 100 percent of susceptible fruit such as apricots, nectarines, peaches and mandarins and to a lesser extent, fruits such as apples and pears" (Broughton & De Lima, n. d.). The only fruit which would survive unaided are thought to be fruit fly tolerant varieties of fruit, and stone fruit maturing early.

As *C. Capitata* is polyphagous, it uses the various suitable hosts found within in its environment as stepping stones, and often moves from one to another as fruit mature throughout the season (Cohen & Yuval, 2000). The fruit ripening sequence of an area is important in terms of early detection, allow the first Medfly of a season to be detected as early as possible (in the earliest-ripening fruit type).

## General Impacts

*Ceratitis capitata* is a serious pest to many crops. Damage to crops caused by *C. capitata* results from:

1. Oviposition in fruit and soft tissues of vegetative parts of certain plants
2. Feeding by the larvae
3. Decomposition of plant tissue by invading secondary microorganisms.

Larval feeding in fruits is the most damaging. Mature, attacked fruits may develop a water soaked appearance. Young fruits become distorted and usually drop. The larval tunnels provide entry points for bacteria and fungi that cause the fruit to rot. These maggots also attack young seedlings, succulent taproots, and stems and buds of host plants.

Trapping for detection of populations; excluding populations by using foliage baits and chemical sprays and release of male sterile medflies to reduce populations require a great deal of resources and can have significant economic implications. Medflies are serious quarantine pests that also affect global trade. The presence of medflies often requires host crops to undergo quarantine treatments or other disinfestation procedure of certification of fly-free areas. The costs of such activities and phytosanitary regulatory compliance can be significant.

Cohen & Yuval (2000) point out that "*C. capitata* is polyphagous and, as such, uses the various hosts in its environment as stepping stones, moving from one to another as fruit mature throughout the season." This gives Medfly the ability to destroy an area's production of many fruits, and means that damage is not limited to just one fruit species, while also providing medflies with refuges from control efforts, serving as a source of reinfestation to surrounding private or commercial plots.

"Under International Plant Protection Convention (IPPC) Standards, *C. capitata* is considered to be a pest that is 'transient, actionable, and under eradication' in the United States' (NAPPO, 2008). All non-European Tephritidae, including *Ceratitis capitata*, are regulated as quarantine pests by the European Union, and fruit being imported into Europe must be free of all life-stages of this pest (Rossler & Chen, 1994).

## Management Info

**Preventative:** Early detection is very important to prevent establishment of populations. Detection programmes using lures and attractants and constant monitoring are required to ensure early detection. Countries which export fruit have to make sure that a comprehensive detection programme is maintained and that strict quarantine procedures are in place to prevent the spread of the pest to flyfree zones. Control options should be started early in spring when temperatures start rising and overwintering adults become active and new adults emerge from the ground (medfly can overwinter as adults, as eggs and larvae in fruit or in their pupal form in the ground).

**Chemical:** An important measure to be taken to ensure success of any chemical control is the disposal of unwanted and medfly infested fruit. Several methods suggested for disposal are: soaking fruit in water topped by a layer of kerosene( to cut off oxygen supply); freezing fruit for a few days; cooking or pureeing fruit. Burial is not recommended at depths of less than 18 inches as medfly can survive a burial . The two main control methods recommended are foliage baiting and cover spraying. The female medfly requires a source of protein for the maturation of her eggs which she sources from fruit juices, bacteria etc from nature. The foliage bait combines a source of protein with an insecticide and is attractive for both the male as well as the female medfly. The bait is usually applied in the morning hours and applies as a spot application aimed at the middle of the trees. Cover spraying controls all life stages through contact and penetrative action. Spraying is carried out when fruits are half or two thirds in size. Depending on the level of infestation the two methods can be used together.

**Physical:** Trapping is not recommended as a control option but is useful for detection. The three types of traps used are those used to trap the male medfly which consists of a parapheromone plus insecticide, a trap for the female medfly using a lure and a wet trap used for both the male and the female medfly which consists of a food source ( a sugar or protein) plus an insecticide. It is good to remember that other insects can also be caught in these traps.

**Biological:** A technique called the sterile insect technique (SIT) is used to contain and exclude populations of medfly. The goal of SIT is to release sterile males to mate with any introduced wild females, resulting in the production of infertile eggs. In California, the SIT program is changing from the release of both male and female sterile flies (bisexual strains) to the use of sterile flies from "male-only" strains (Jang *et al.* 2003).

Please follow this link for [detailed information on the management of the \*Ceratitis capitata\*](#).

## Pathway

Insects lay their eggs under the skin of fruit (Mau and Kessing, 1992).

**Principal source:** [Mau and Kessing 1992. \*Ceratitis capitata\* \(Wiedemann\)](#)

**Compiler:** National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

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**Review:** Eric Jang\ Research Leader\ U.S. Pacific Basin Agric. Res. Center

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## ALIEN RANGE

[1] AFRICA  
[1] ALGERIA  
[1] ARGENTINA  
[1] AUSTRIA  
[1] BOLIVIA  
[1] BRAZIL

[1] ALBANIA  
[1] ANGOLA  
[3] AUSTRALIA  
[1] BERMUDA  
[1] BOTSWANA  
[1] BURKINA FASO

[1] BURUNDI	[1] CAMEROON
[1] CAPE VERDE	[1] COLOMBIA
[1] CONGO, THE DEMOCRATIC REPUBLIC OF THE	[1] COSTA RICA
[1] CYPRUS	[1] ECUADOR
[1] EGYPT	[1] EL SALVADOR
[1] ETHIOPIA	[1] EX-YUGOSLAVIA
[1] FRANCE	[1] GERMANY
[1] GHANA	[2] GREECE
[1] GUATEMALA	[1] GUINEA
[1] HONDURAS	[1] HUNGARY
[1] ISRAEL	[2] ITALY
[1] JORDAN	[1] KENYA
[1] LEBANON	[1] LIBERIA
[1] LIBYAN ARAB JAMAHIRIYA	[1] MADAGASCAR
[1] MALAWI	[1] MALI
[1] MALTA	[1] MAURITIUS
[1] MOROCCO	[1] MOZAMBIQUE
[1] NETHERLANDS	[1] NEW ZEALAND
[1] NICARAGUA	[2] NIGERIA
[1] PANAMA	[1] PARAGUAY
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[1] SIERRA LEONE	[1] SOUTH AFRICA
[2] SPAIN	[1] SUDAN
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[1] TUNISIA	[1] TURKEY
[1] UGANDA	[5] UNITED STATES
[1] URUGUAY	[1] VENEZUELA
[1] ZAMBIA	

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#### Management information

Fisher, K. T., Hill, A. R., Sproul, A. N. Eradication of *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) in Carnarvon, West Australia J. Aust. Entomol. Soc 1985 vol. 24, page 207

**Summary:** Eradication study

Jang, Eric B., Holler, Tim, Cristofaro, Massimo, Lux, Slawomir, Raw, Andre S., Moses, Amy L., Carvalho, Lori A. 2003 Improved Attractants for Mediterranean Fruit Fly, *Ceratitis capitata* (Wiedemann): Responses of Sterile and Wild Flies to (-) Enantiomer of Ceralure B1. Journal of Economic Entomology 96: 1719-1723

[Mau, Ronald and Kessing, Jayma. 1992. \*Ceratitis capitata\* \(Wiedemann\) Knowledge Master \[Online Database\], Hawaii.](#)

**Summary:** A detailed report on distribution, description, impacts, reproduction, life cycles, and control.

Available from: <http://www.extento.hawaii.edu/kbase/crop/Type/ceratiti.htm> [Accessed 8 October 2003]

Meats A.W.; Clift A.D.; Robson M.K. 2003. Incipient founder populations of Mediterranean and Queensland fruitflies in Australia: the relation of trap catch to infestation radius and models for quarantine radius. Australian Journal of Experimental Agriculture. Vol. 43, no. 4, pp. 397-406(10)

**Summary:** Relationship between trap catch and infection radius.

[Robert S. Copeland, Robert A. Wharton, Quentin Luke and Marc De Meyerd., 2002. Indigenous Hosts of \*Ceratitis capitata\* \(Diptera:Tephritidae\) in Kenya Annals of the Entomological Society of America: Vol. 95, No. 6, pp. 672-694.](#)

**Summary:** Relationship between the medfly and native host-plants in Kenya.

[Thomas, M.; Heppner, J.; Woodruff, R.; Weems H.; and Steck G. 2001. Mediterranean fruit fly Featured Creatures \[Online Database\] Florida Department of Agriculture and Consumer Services.](#)

**Summary:** A detailed report on distribution, description, impacts, reproduction, life cycles, and control.

Available from: [http://creatures.ifas.ufl.edu/fruit/Mediterranean\\_fruit\\_fly.htm](http://creatures.ifas.ufl.edu/fruit/Mediterranean_fruit_fly.htm) [Accessed 8 October 2003]



# GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: *Ceratitis capitata*

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[Walker, K. 2006. Mediterranean fruit fly \(\*Ceratitis capitata\*\) Pest and Diseases Image Library. Updated on 8/09/2006 1:46:44 PM.](#)

**Summary:** PaDIL (Pests and Diseases Image Library) is a Commonwealth Government initiative, developed and built by Museum Victoria's Online Publishing Team, with support provided by DAFF (Department of Agriculture, Fisheries and Forestry) and PHA (Plant Health Australia), a non-profit public company. Project partners also include Museum Victoria, the Western Australian Department of Agriculture and the Queensland University of Technology. The aim of the project is: 1) Production of high quality images showing primarily exotic targeted organisms of plant health concern to Australia. 2) Assist with plant health diagnostics in all areas, from initial to high level. 3) Capacity building for diagnostics in plant health, including linkage developments between training and research organisations. 4) Create and use educational tools for training undergraduates/postgraduates. 5) Engender public awareness about plant health concerns in Australia. PaDIL is available from : <http://www.padil.gov.au/aboutOverview.aspx>, this page is available from: <http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=652> [Accessed 6 October 2006]

## General information

[Barry, James D., Vargas, Roger I., Miller, Neil W., Morse, Joseph G. 2003. Feeding and Foraging of Wild and Sterile Mediterranean Fruit Flies \(Diptera: Tephritidae\) in the Presence of Spinosad Bait. Journal of Economic Entomology 96: 1405-1411](#)

[Burns, R. E; Harris, D.L; Moreno, D.S and Eger, J.E. 2001. Efficacy of spinosad bait sprays to control Mediterranean and Caribbean fruit flies \(Diptera: Tephritidae\) in commercial citrus in Florida. Florida Entomologist 84 \(4\) 672-678](#)

[ITIS \(Integrated Taxonomic Information System\), 2004. Online Database \*Ceratitis capitata\*](#)

**Summary:** An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.

Available from: [http://www.itis.gov/servlet/SingleRpt/SingleRpt?search\\_topic=TSN&search\\_value=143196](http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=143196) [Accessed December 31 2004]

[Liquido, N. J., Shinoda, L. A., Cunningham, R. T. Host plants of the Mediterranean fruit fly \(Diptera: Tephritidae\) an annotated world review Misc. Publ. Entomol. Soc. Am 1991 vol. 77, page 5](#)

**Summary:** A global list of host plants.

[Maelzer D.A.; Bailey P.T and Perepelicia N. 2004. Factors supporting the non-persistence of fruit fly populations in South Australia. Australian Journal of Experimental Agriculture. Vol. 44, no. 1, pp. 109-126 \(18\)](#)

[Vera, M. Teresa, Rodriguez, Rafael, Segura, Diego F., Cladera, Jorge L., Sutherst, Robert W. Potential Geographical Distribution of the Mediterranean Fruit Fly, \*Ceratitis capitata\* \(Diptera: Tephritidae\), with Emphasis on Argentina and Australia. Environmental Entomology 2002 31: 1009-1022](#)

**Summary:** Predicting potential distribution using CLIMEX- a climate matching model.