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FruitFlyNet

A Location-aware System for Fruit Fly Monitoring and Pest Management Control

Introduction to fruit flies – why are fruit flies hard to control

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The 2007-2013 ENPI CBC Mediterranean Sea Basin Programme is a multilateral Cross-Border Cooperation initiative funded by the European Neighbourhood and Partnership Instrument (ENPI). The Programme objective is to promote the sustainable and harmonious cooperation process at the Mediterranean Basin level by dealing with the common challenges and enhancing its endogenous potential. It finances cooperation projects as a contribution to the economic, social, environmental and cultural development of the Mediterranean region. The following 14 countries participate in the Programme: Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Malta, Palestine, Portugal, Spain, Syria (participation currently suspended), Tunisia. The Joint Managing Authority (JMA) is the Autonomous Region of Sardinia (Italy). Official Programme languages are Arabic, English and French (www.enpicbmed.eu).

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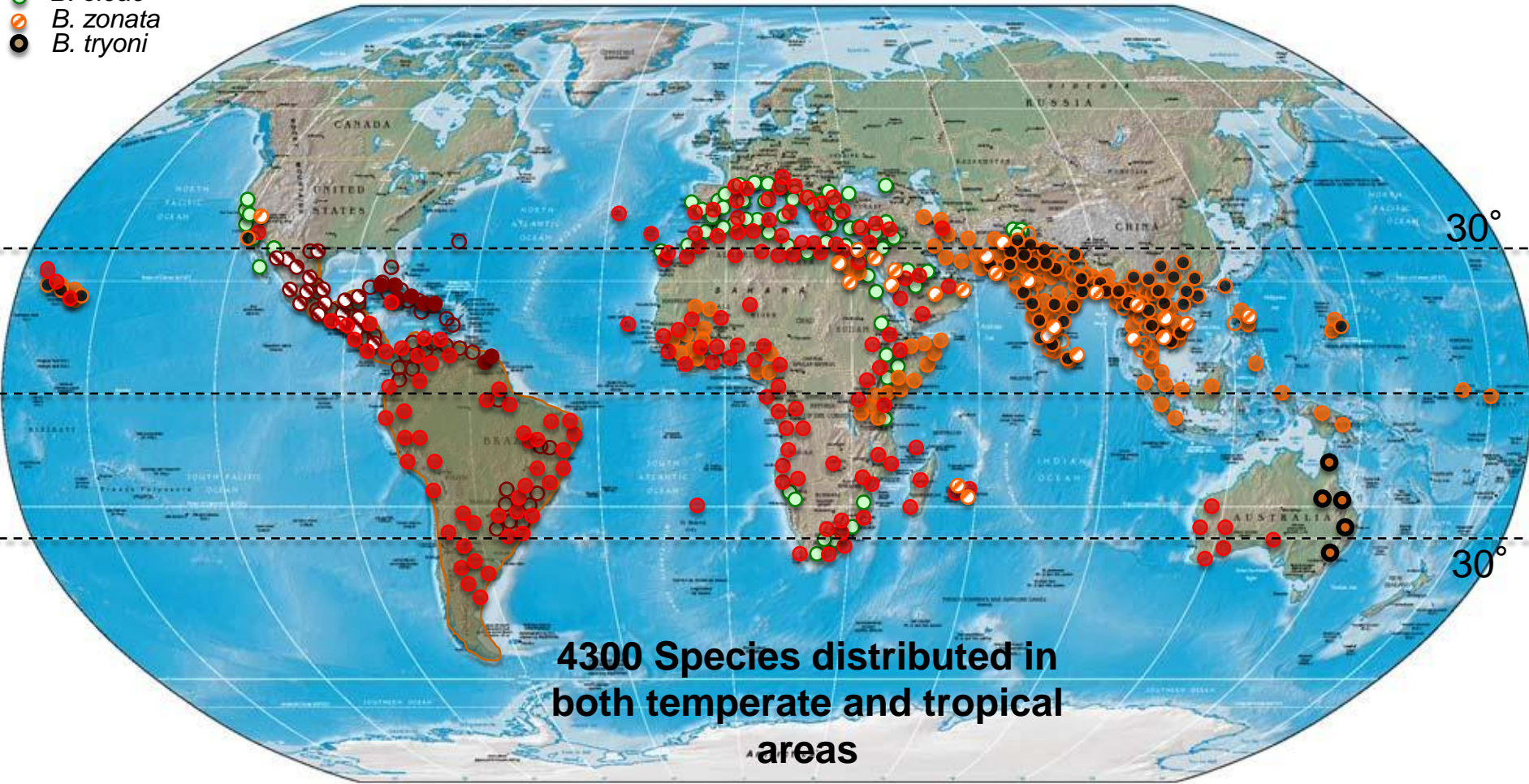
Name, Email

Global distribution of major fruit fly species



- A. obliqua*
- A. suspensa*
- A. ludens*
- C. capitata*
- B. correcta*
- B. cucurbitae*
- B. dorsalis*
- B. oleae*
- B. zonata*
- B. tryoni*

(based on CABI maps and recent publications)



4300 Species distributed in both temperate and tropical areas

Economic Importance



- Major pests of fresh fruits and vegetables
- Ability to infest healthy tissue
- Extensive losses of commercial cultivations
- Invasive species
- Quarantine regulations
- Intimate association with their host plant taxa
- Difficulties to manage populations



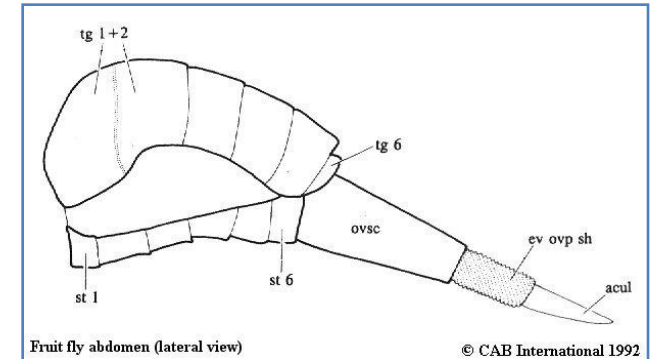
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Description – Morphology



- Prominent features of fruit fly adults
 - Size 2 – 25 mm length
 - Sexual dimorphism common
 - chitinized ovipositor sheath and a needle-like ovipositor
 - “picture wings” that are prominently patterned with stripes or spots
 - bodies with strongly contrasting colors, such as yellow stripes or spots on a dark background, (*Toxotrypana*, mimic wasps), or bold black stripes on the wings, as in some species of *Rhagoletis* and *Zonosemata* (mimic jumping spiders)

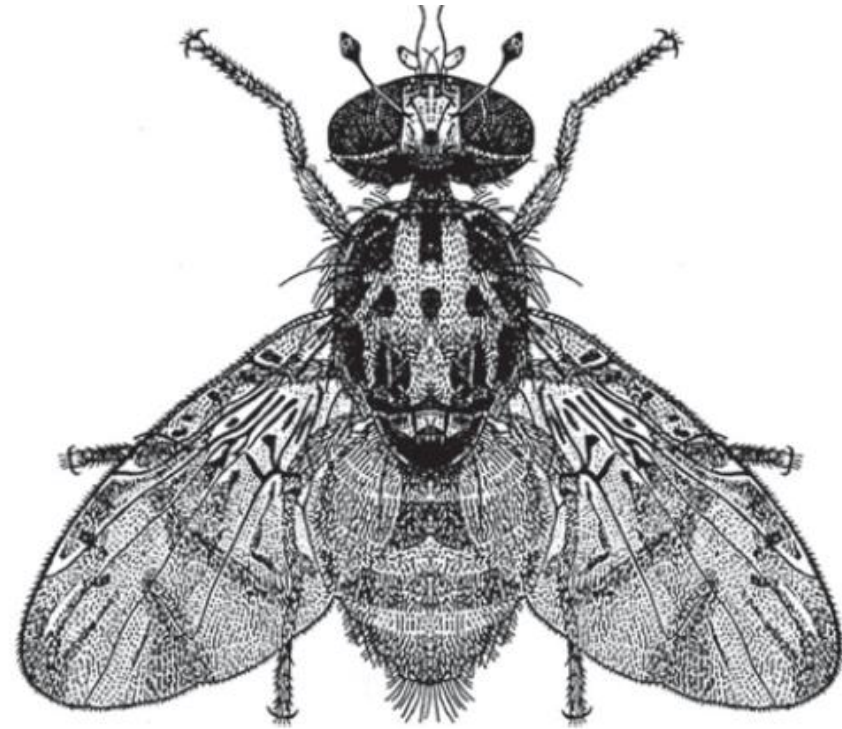


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Major Fruit Fly Genera

- *Bactrocera* (500 species)
 - *B. dorsalis*, *B. cucurbitae*, *B. tryoni*, *B. invadens*, *B. oleae*
- *Ceratitis* (> 90 species)
 - *C. capitata*, *C. cosyra*, *C. rosa*
- *Dacus* (250 species)
 - *D. ciliatus*
- *Anastrepha* (200 species)
 - *A. suspensa*, *A. ludens*, *A. striata*, *A. fraterculus*
- *Rhagoletis* (>60)
 - *R. cerasi*, *R. pomonella*, *R. completa*



Threat by fruit flies for the Mediterranean and Europe



Long jumps



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Fruit fly threats for Europe

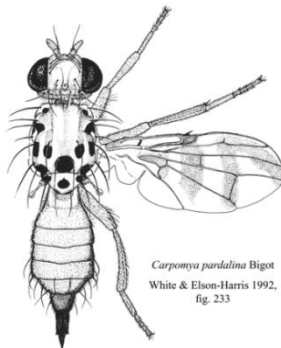


R. completa



R. cingulata

Detected – Established
in northern European
countries



C. pardalina



B. zonata



D. ciliatus

Detected – Established
in neighbouring areas



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Mediterranean Area



- Established species
 - Mediterranean fruit fly *Ceratitidis capitata*
 - Olive fly *Bactrocera oleae*
 - Cherry fruit fly *Rhagoletis cerasi*
- Newly established and detected species
 - Peach fruit fly *Bactrocera zonata* (Egypt, Israel)
 - Ethiopian or lesser pumpkin or cucurbit fruit fly *Dacus ciliatus* (Southern Israel, Jordan)



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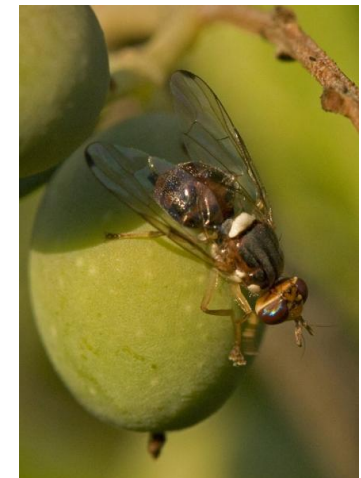
Why are fruit flies so difficult to control?



- High fecundity rates
- Long lifespan
- Polyphagous species
- Monophagous, stenophagous or oligophagous species with tight adaptation and synchronization to their host/hosts



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Mediterranean fruit fly, *Ceratitis capitata*



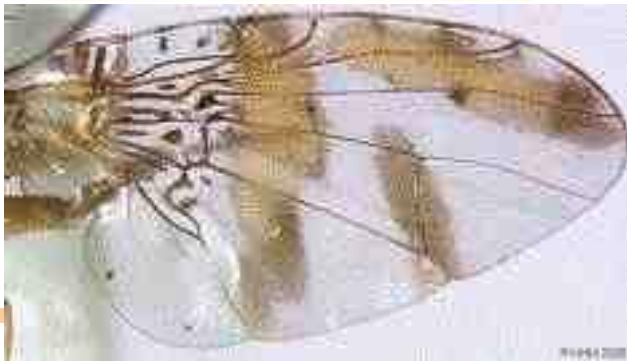
- The most important pest of fruits globally
 - Hosts: > 300 species (citrus, stone and pome fruit, subtropical and tropical fruit)
- Wide geographic distribution
- Invasive species
- Multivoltine
- Infests fruits just before maturation – problems with insecticide residues
- Very difficult to control individually by each producer



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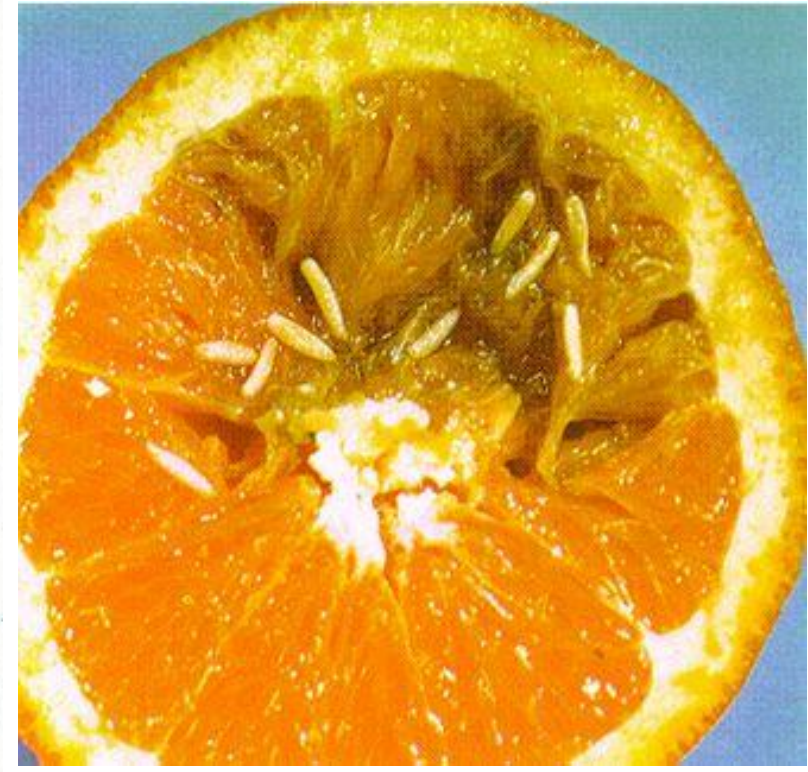
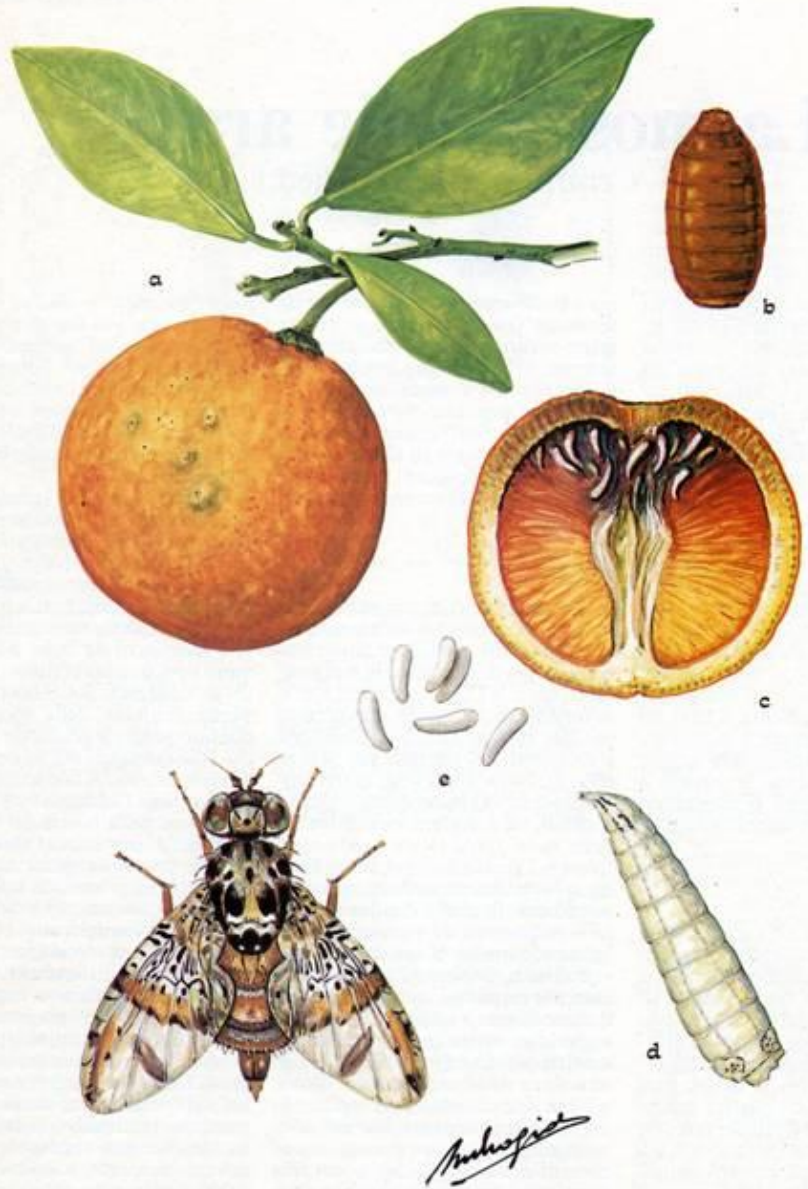
Adults



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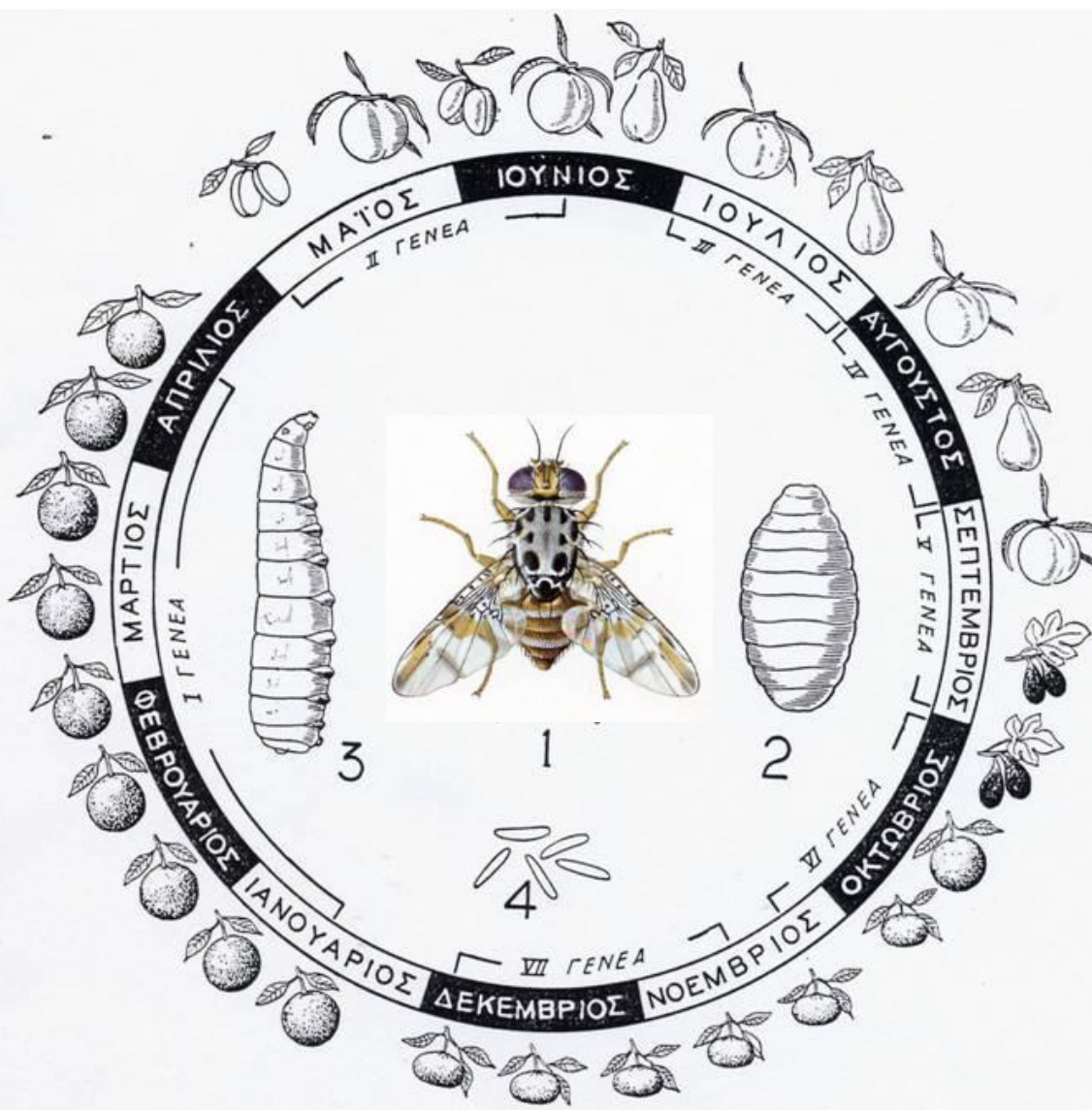
Life history of medfly



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Seasonal biology of medfly



- Timing of fruit maturation and environmental factors determine:
 - Population levels
 - Dispersion



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Hosts



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Cherry fruit fly *Rhagoletis cerasi*



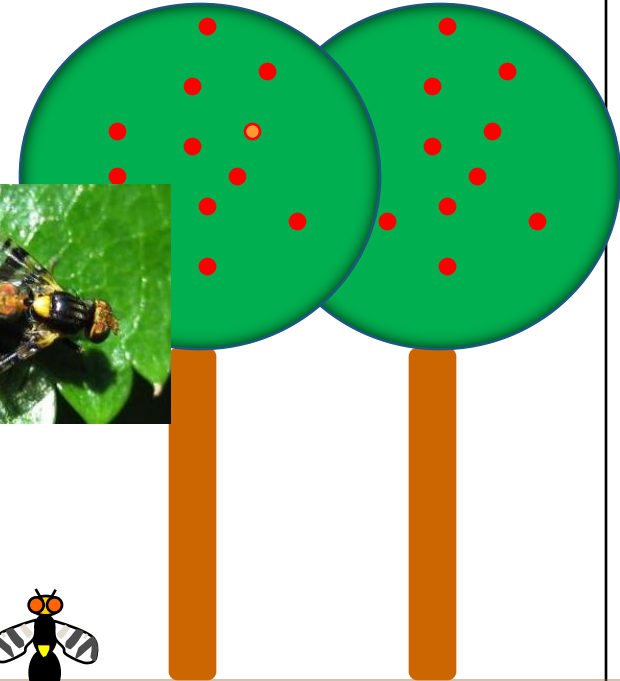
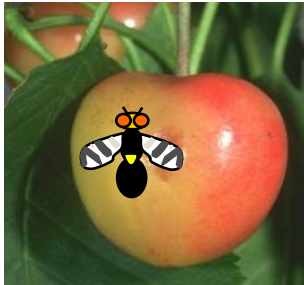
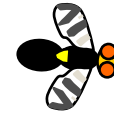
So far the most important pest of cherries and sour cherries
in Europe and elsewhere

Direct damage by larvae feeding
in the fruit mesocarp coupled
with fungi and bacterial
infections

At early stages of infestation
hard to separate infested
fruits.



Life history of *R. cerasi*



Challenges in cherry fruit fly control



- Stenophagous
 - Sweet and sour cherries, *P. mahaleb*, *Lonicera* spp. *Berberis vulgaris*
 - Univoltine
 - Strict synchronization with host
- Crucial to predict emergence of first adults in spring
 - Trapping
 - Fruit sampling
- Infestation on ripening and/or ripe fruits
 - Limited range of insecticides (deltamethrin, thiamethoxam) – prohibition of dimethoate
 - Insecticide residues



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Olive fly *Bactrocera oleae*



- Practically monophagous.
- Several generations (usually 3 – 5) per year
- Two seasonal peaks in adult activity (spring and autumn), depression of population density during summer
- Overwintering, adult or pupae in the soil in cooler areas (all stages active in warmer areas)



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Challenges in olive fly control



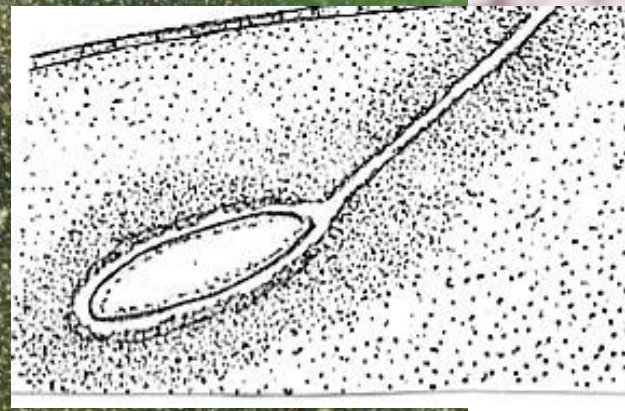
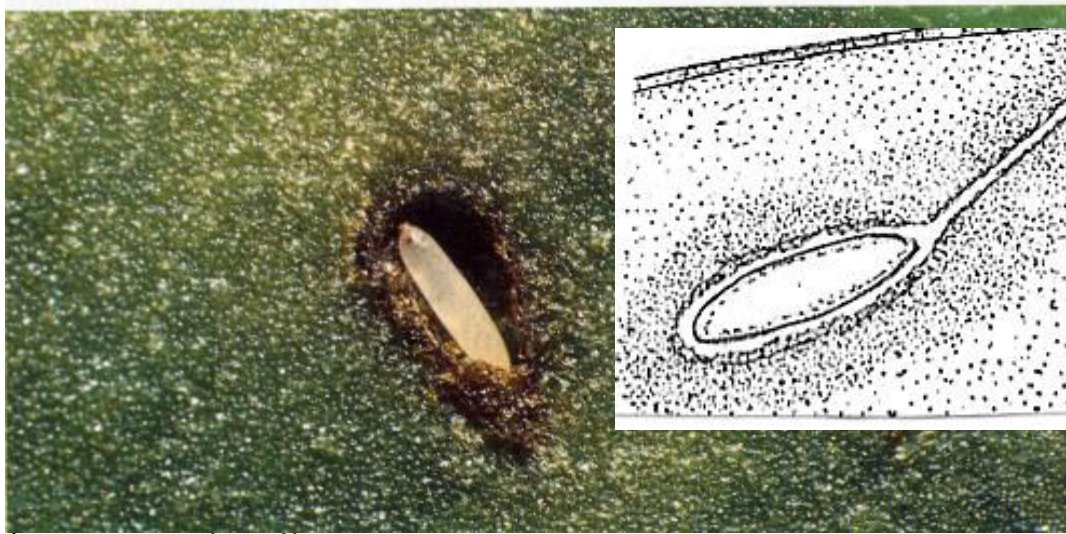
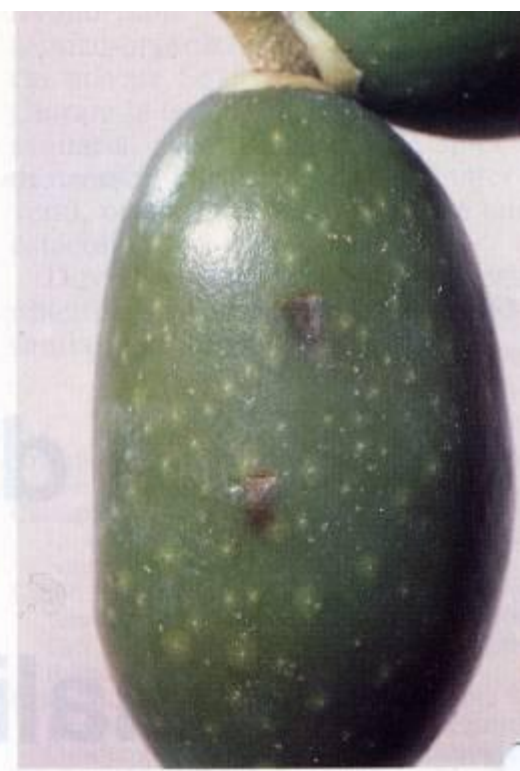
- Long life span, overlapping generations, high fecundity rates
- Dispersion in long distances
- Infests immature and mature olive fruits
- Environmental factors strongly and variably affect population levels
- Wild growing olive trees may serve as refugees
- Resistance to insecticides?



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Oviposition stings and eggs



Olive fly *Bactrocera oleae*



Infested olives

Newly deposited egg



Late infestation



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Conclusion



- Fruit flies are major pests causing difficulties in controlling them
- There is need for optimizing fruit fly management procedures, especially monitoring and timing of spraying applications
- Bringing technology and precision agriculture to fruit fly management



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FruitFly Net

Thank you!!!



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