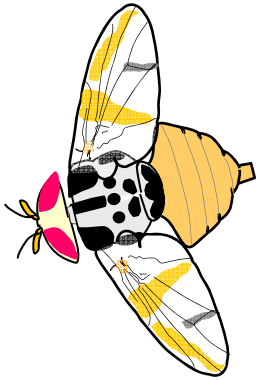
Geographic distribution, population dynamics and management of the Mediterranean fruit fly in northern Mediterranean countries



Nikos Papadopoulos

Laboratory of Entomology and Agricultural Zoology

University of Thessaly, Greece

Synopsis

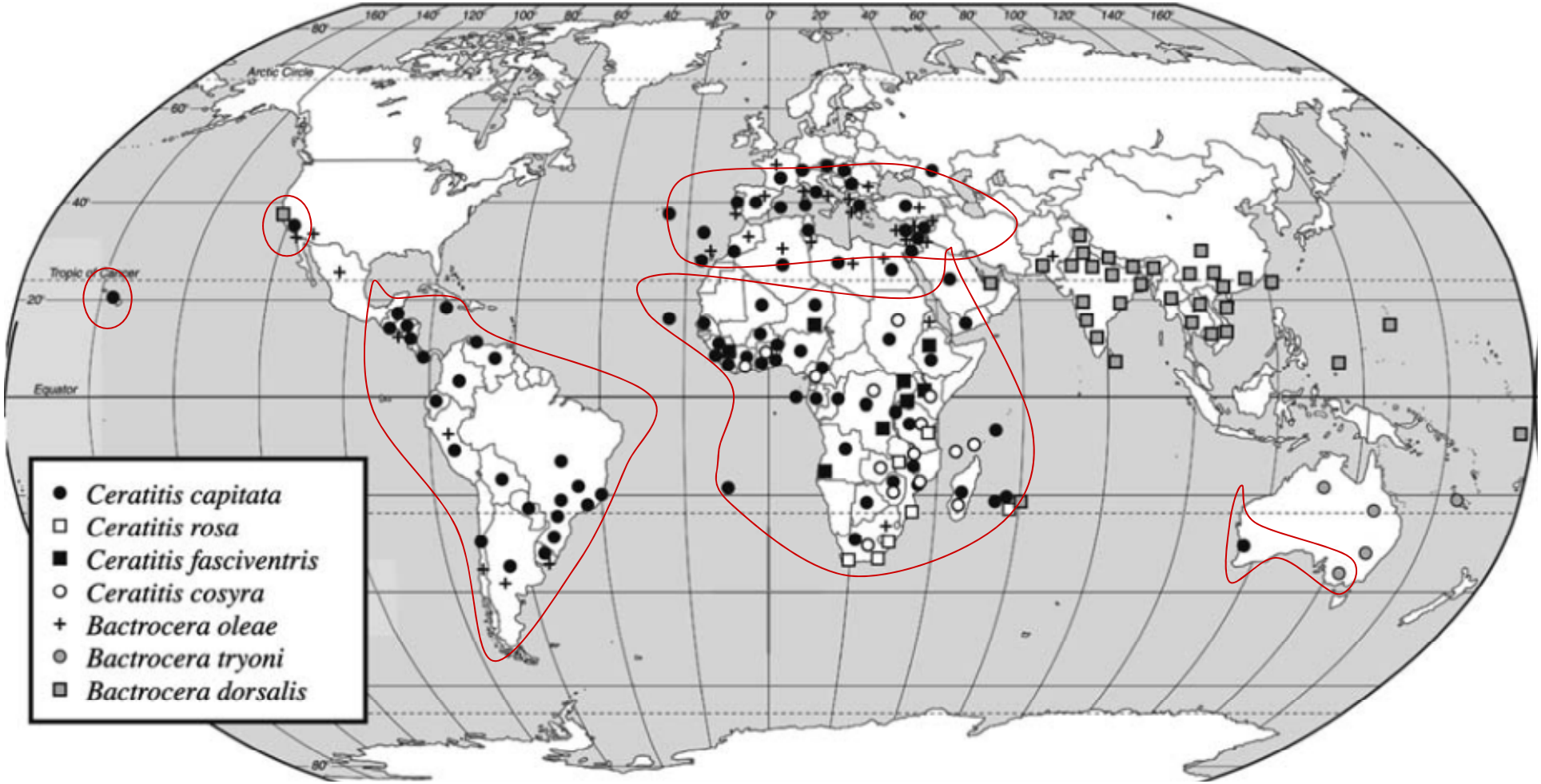
- Geographical distribution and origin
- Distribution in Europe and Mediterranean
- Life history, overwintering, and population dynamics across a gradient of latitudes
  - Crete, south Greece
  - Chios, central Greece
  - Volos, central Greece
  - Thessaloniki, north Greece
  - Podgorica, Montenegro
  - Dubrovnik, Croatia,
  - Spit, Croatia
- Summary of medfly phenology in different Mediterranean countries
- Modeling phenology and management decisions
- Conclusions

Mediterranean fruit fly, *Ceratitis capitata*, (Diptera: Tephritidae)

Biological characteristics

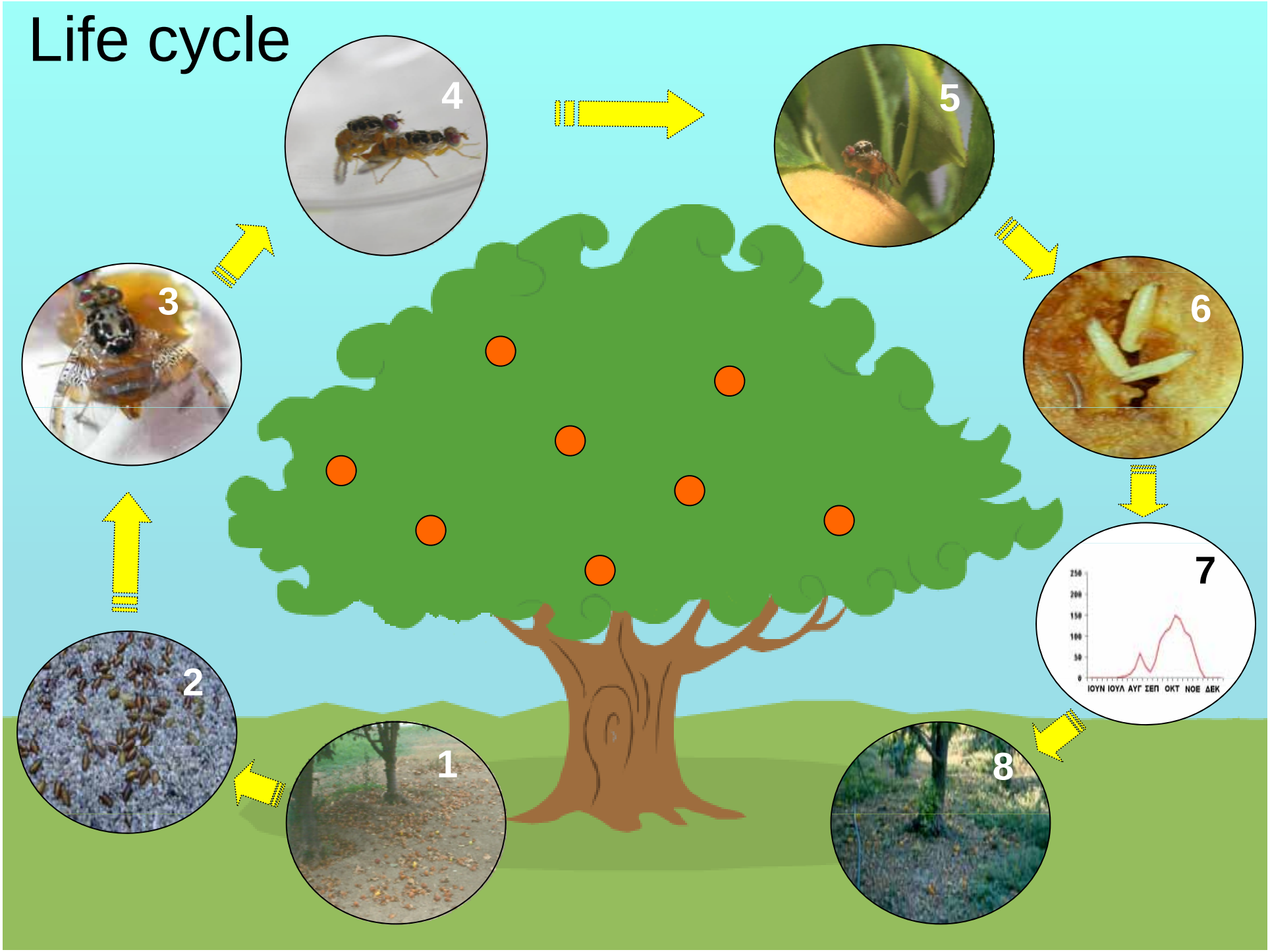
- Extremely polyphagous
  - Hosts: > 300 fruit species
- Multivoltine
  - 3 – more than 10 generation per year
- Plastic adjustments in life history traits
  - Thermal plasticity
- Geographic Distribution
  - Cosmopolitan
- One of the most important pest for the word fruit production
  - Stone, Pome, Citrus, other
- Control extremely difficult
  - Area wide control

Global Geographic Distribution

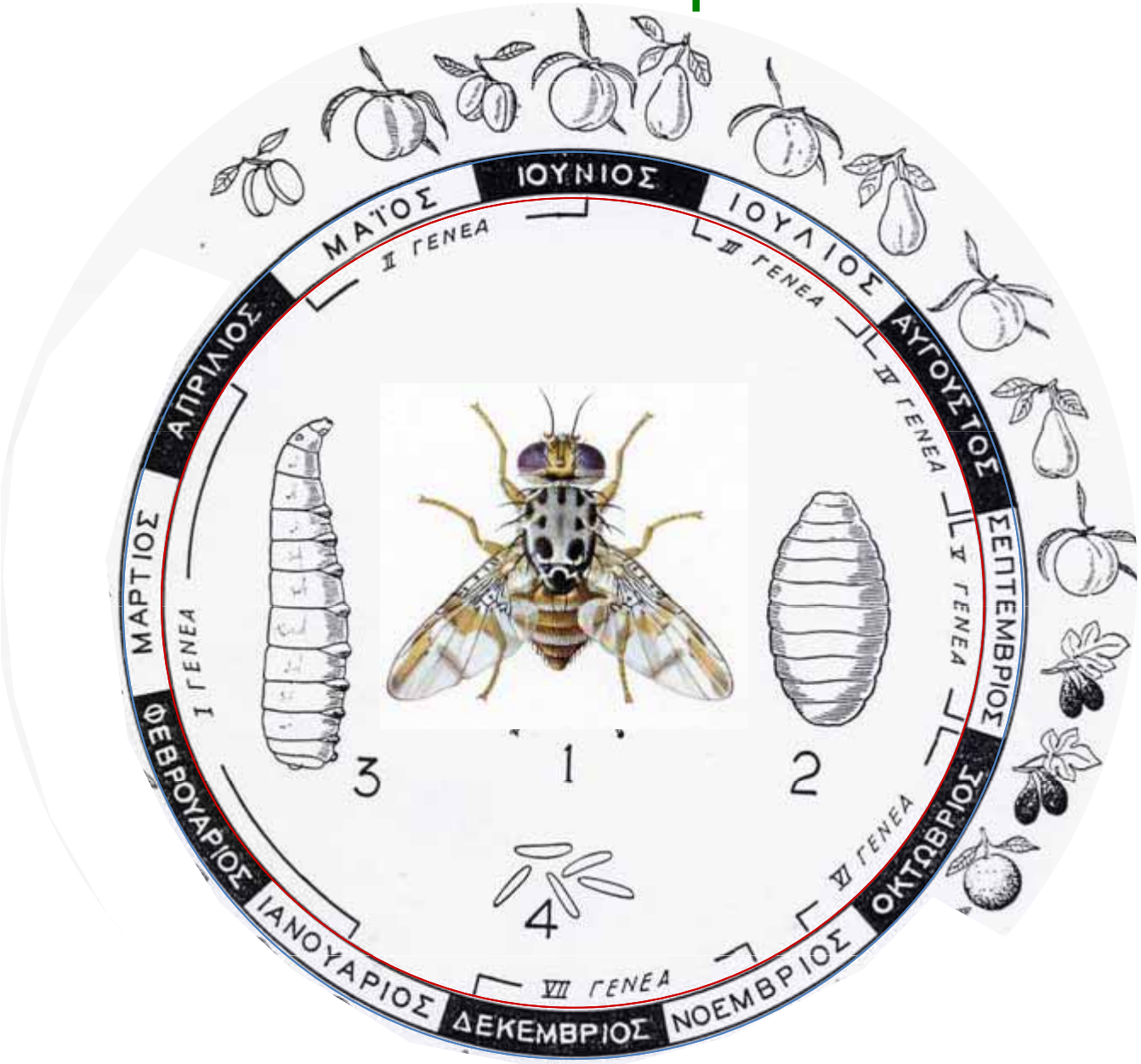


Malacrida et al 2007

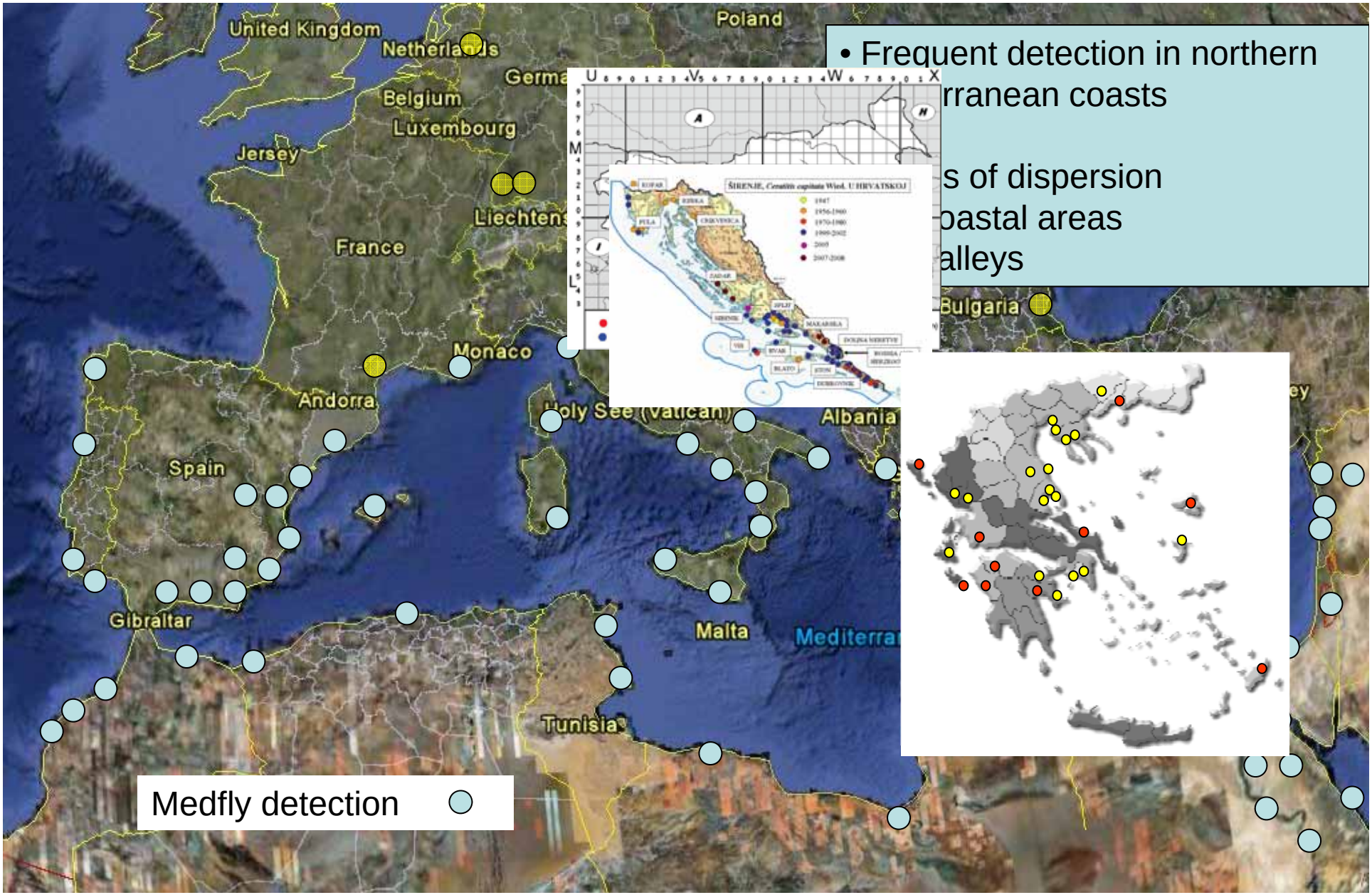
Life cycle



Seasonal development



Distribution in Mediterranean and Europe



- Frequent detection in northern
rranean coasts

s of dispersion
oastal areas
alleys

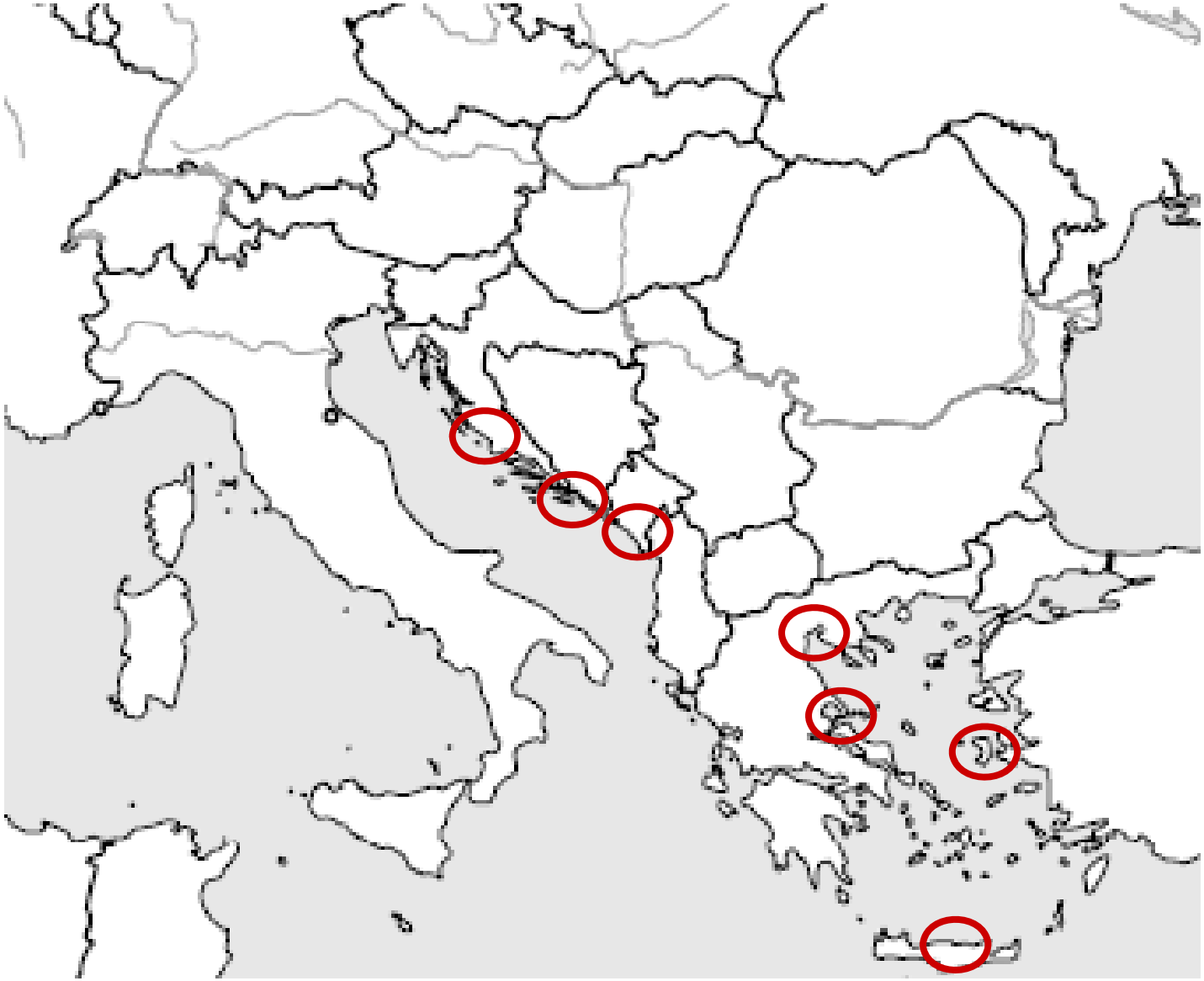
Aim of the current paper

- Review the phenology of medfly
  - emphasis on cooler more temperate areas
- Define key life history traits of such a successful invader
- Understand phenology in extreme environments
- Understand patterns of dispersion in northern-temperate areas
- Develop simple model to base management strategies.

Methods

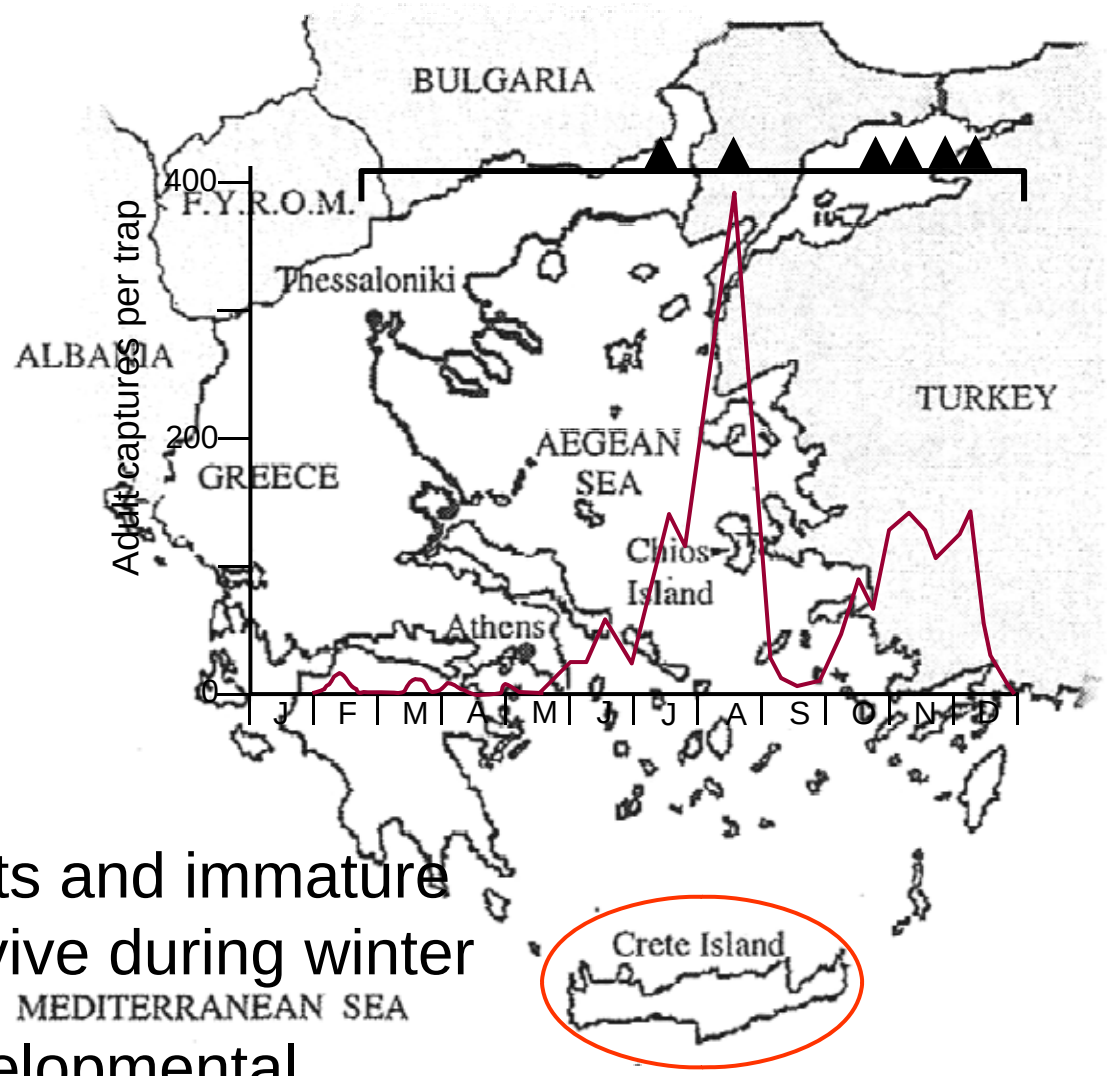
- Case studies along a gradient of latitudes
  - Crete, Greece
  - Chios, Greece
  - Volos, Greece
  - Thessaloniki, Greece
  - Montenegro
  - Dubrovnik, Croatia
  - Split, Croatia
- Summarize the phenology in different Mediterranean areas
- Life history data
  - Field and laboratory studies

Study areas



Life history, overwintering, and population dynamics in temperate areas

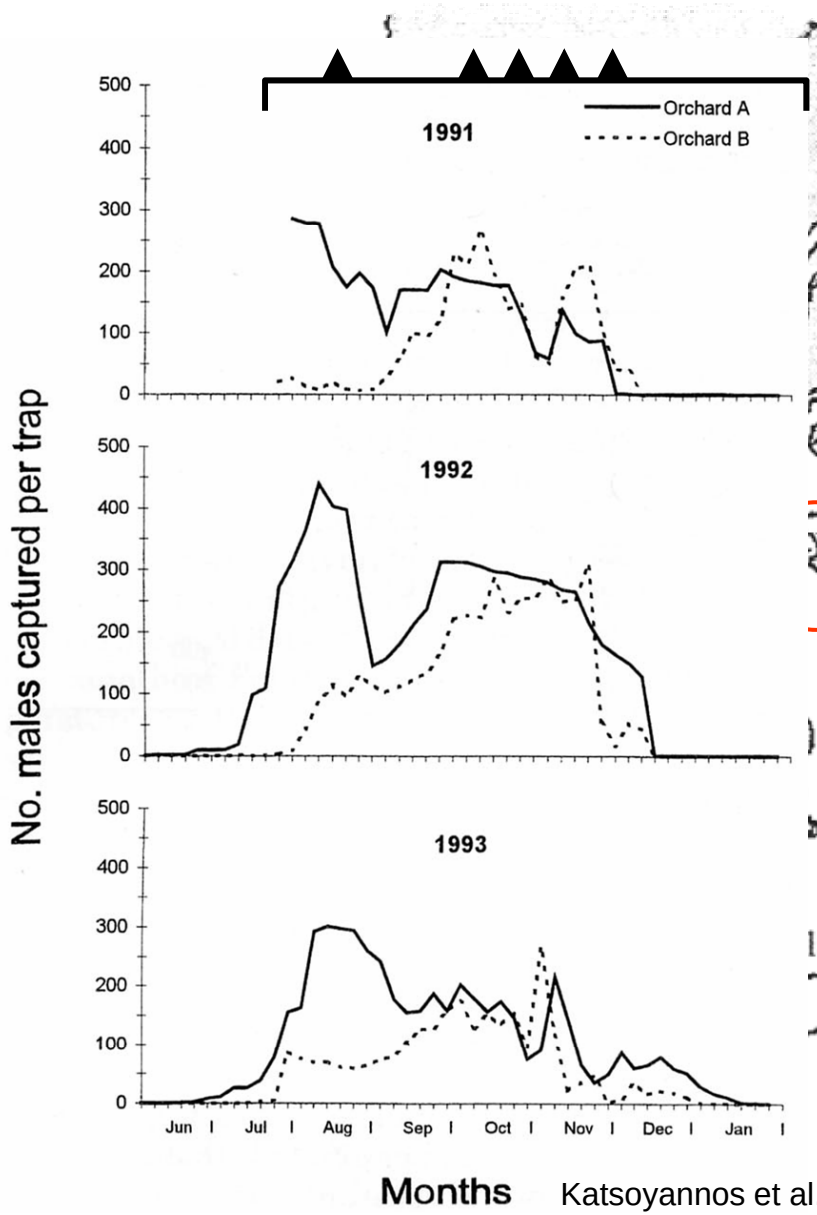
Crete, Greece



- Both adults and immature stages survive during winter
- Long developmental duration of immatures

Michelakisl. 1992. Israel Journal of Entomology
Mavrikakis et al. 2000. Ann. Entomol. Soc. Am.

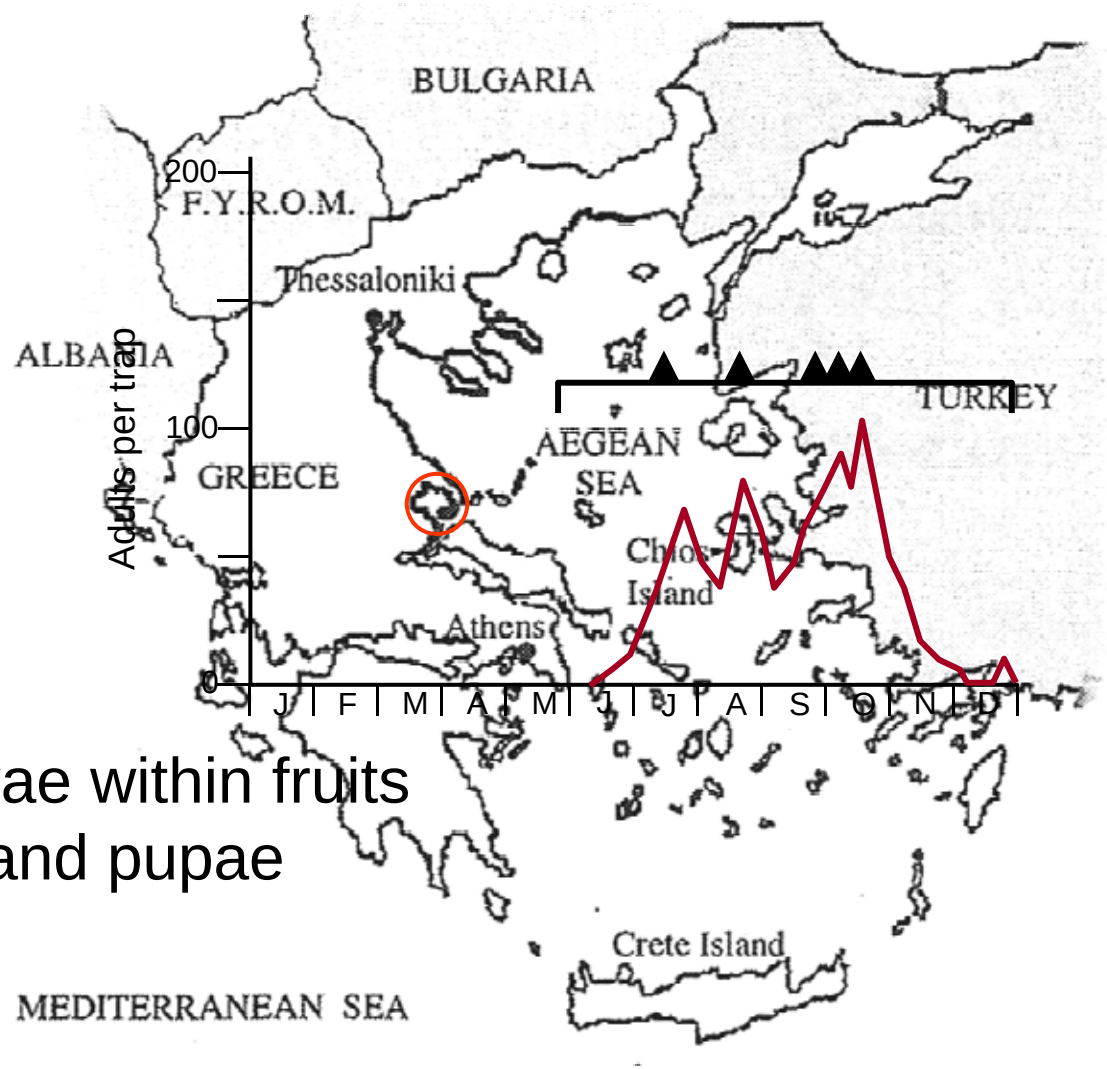
Chios, Greece



- Larvae within citrus fruits overwinter

Katsoyannos et al. 1998. Ann. Entomol. Soc. Am.

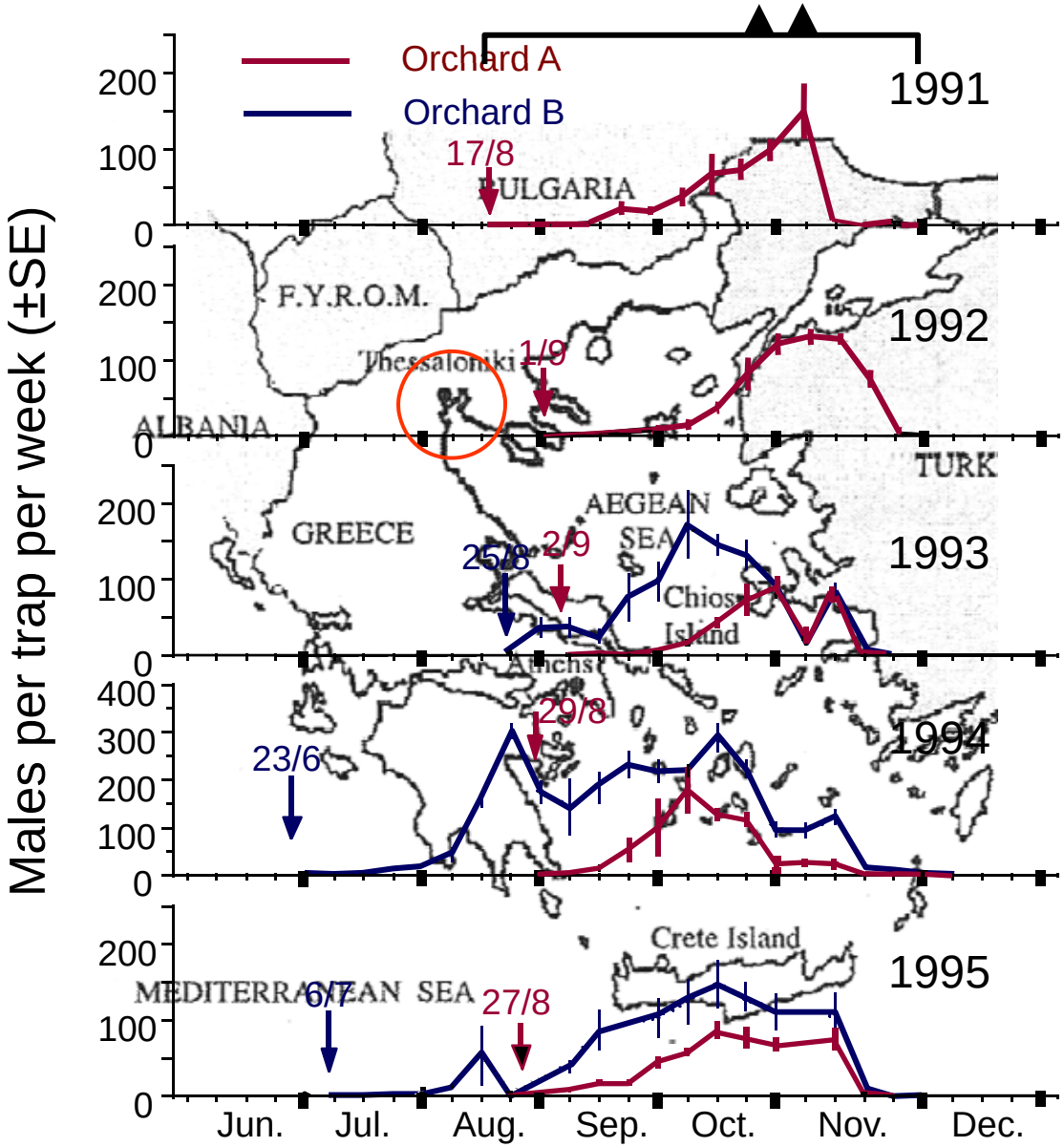
Volos, Greece



- Mainly larvae within fruits overwinter, and pupae

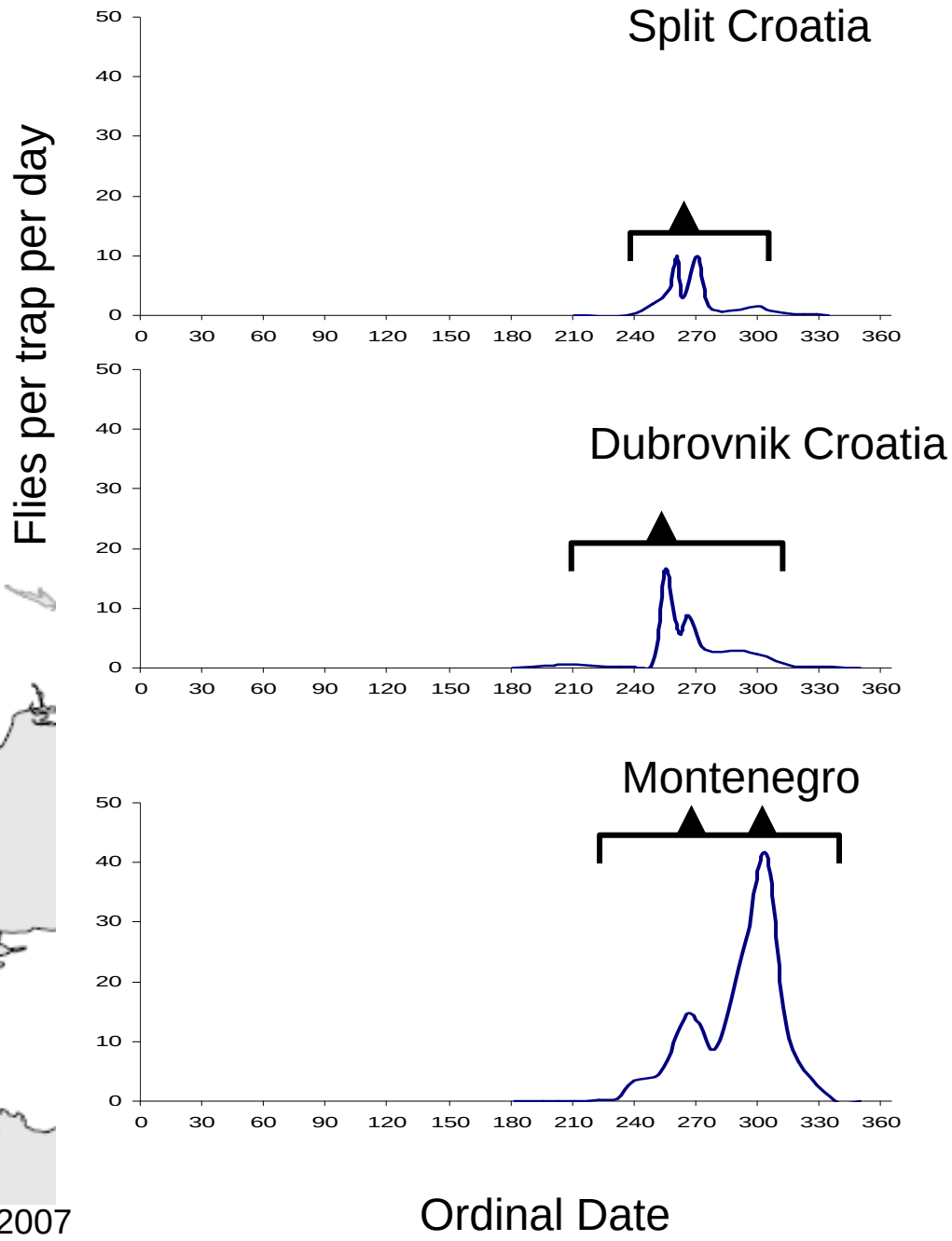
Papadopoulos et al. 2010

Northern Greece



Papadopoulos et al. 2001. Ann. Entomol. Soc. Am. 94: 41-50

Adult phenology Montenegro, Croatia



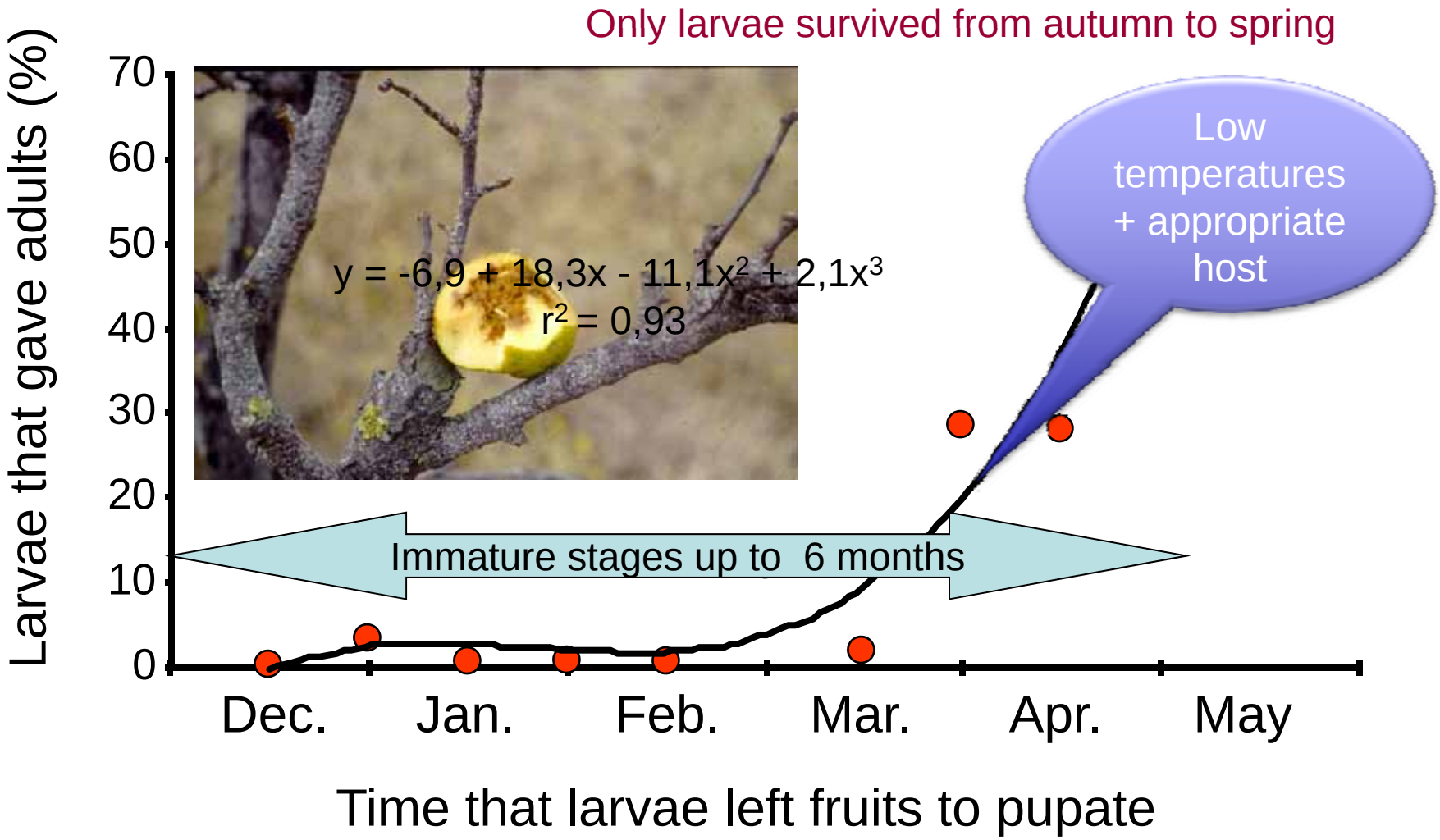
Bjelics et al. 2007
Radovic 2010.(unpublished data)

How populations persist in cooler temperate areas?

Life history adjustments?

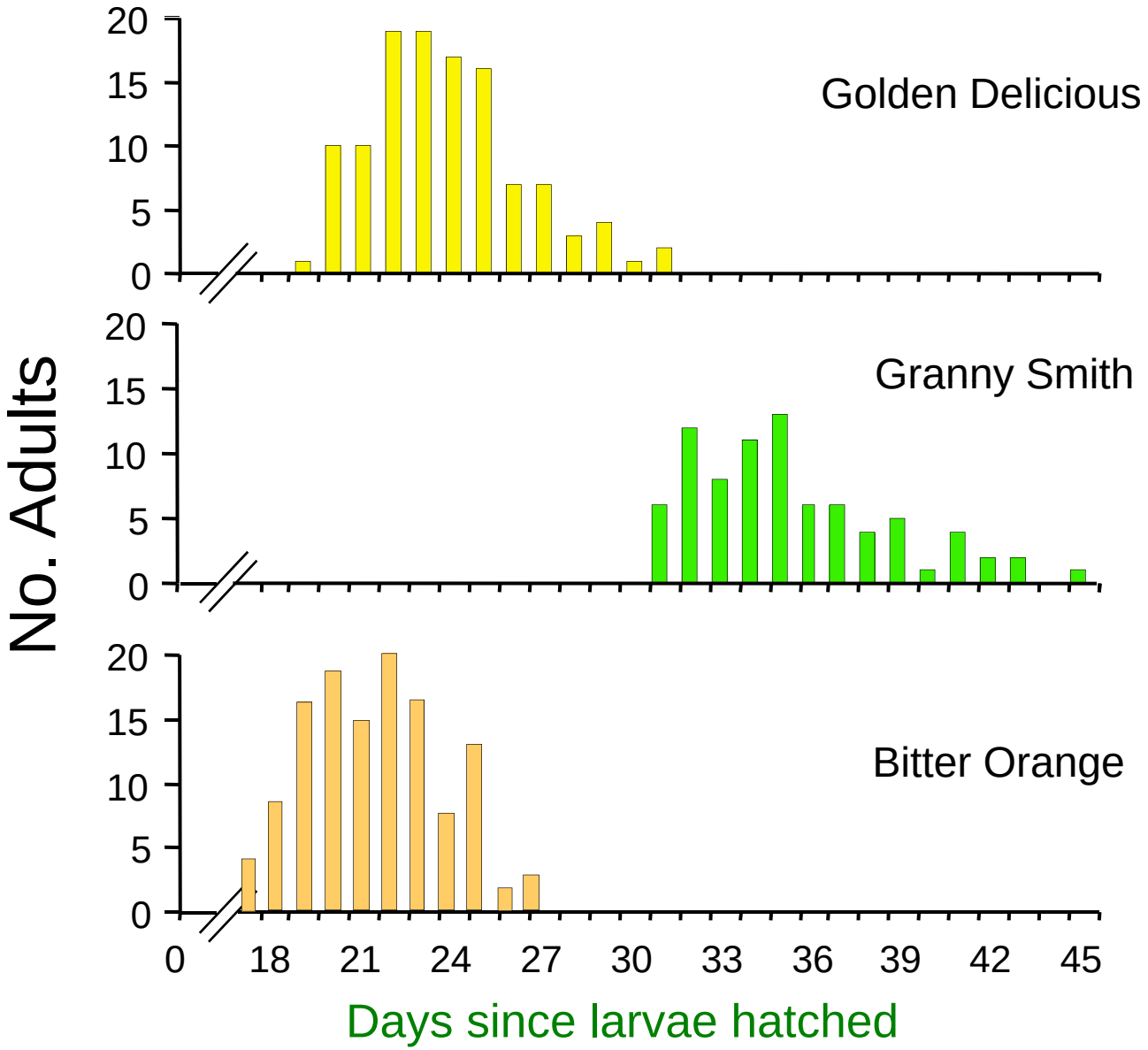
What makes medfly such a successful invader?

Survival of larvae in field conditions



Papadopoulos et al. 1996. Ann. Entomol. Soc. Am. 89: 526-534.

Plasticity in immatures developments



Avg. days

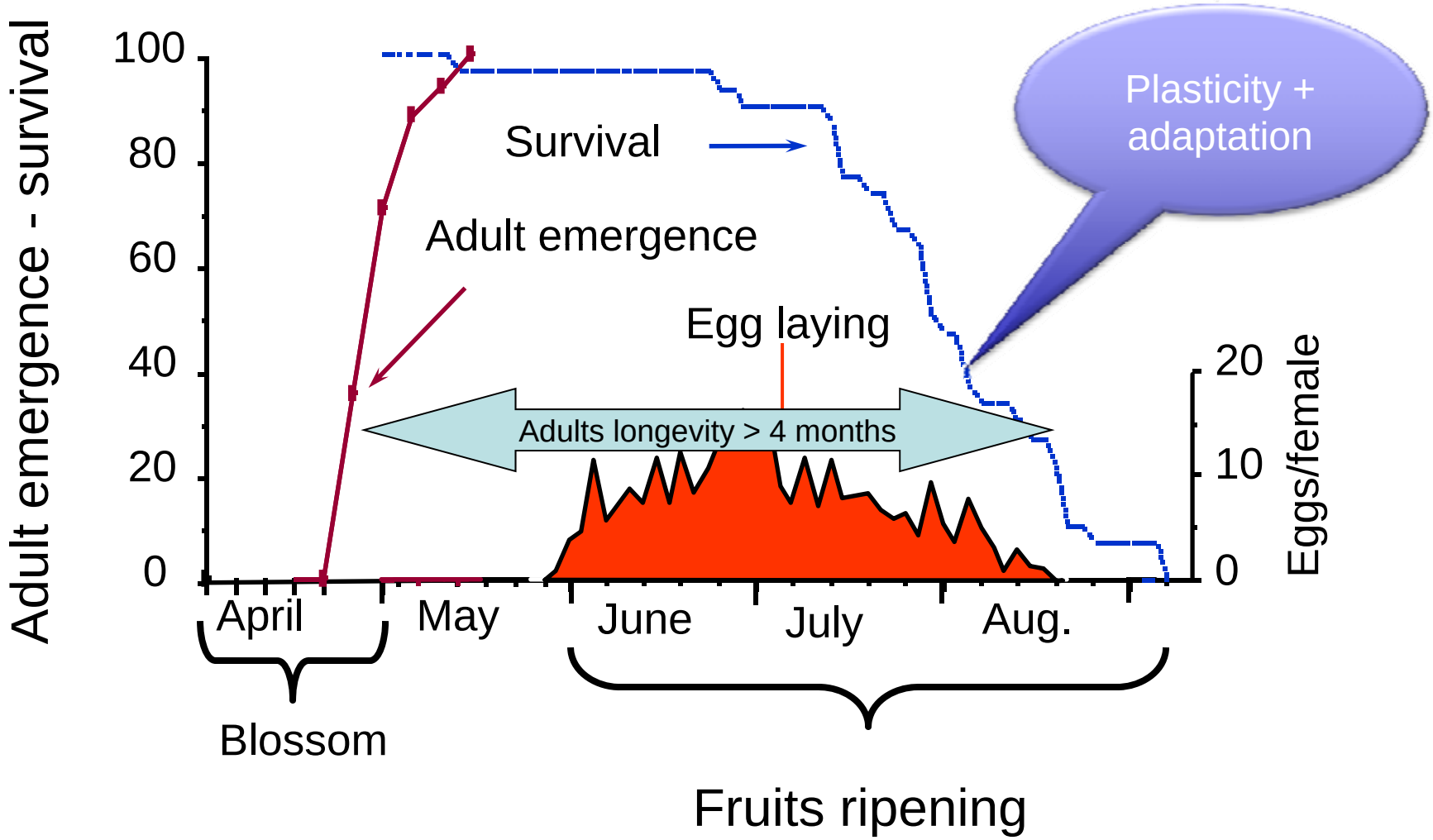
23.1

35.3

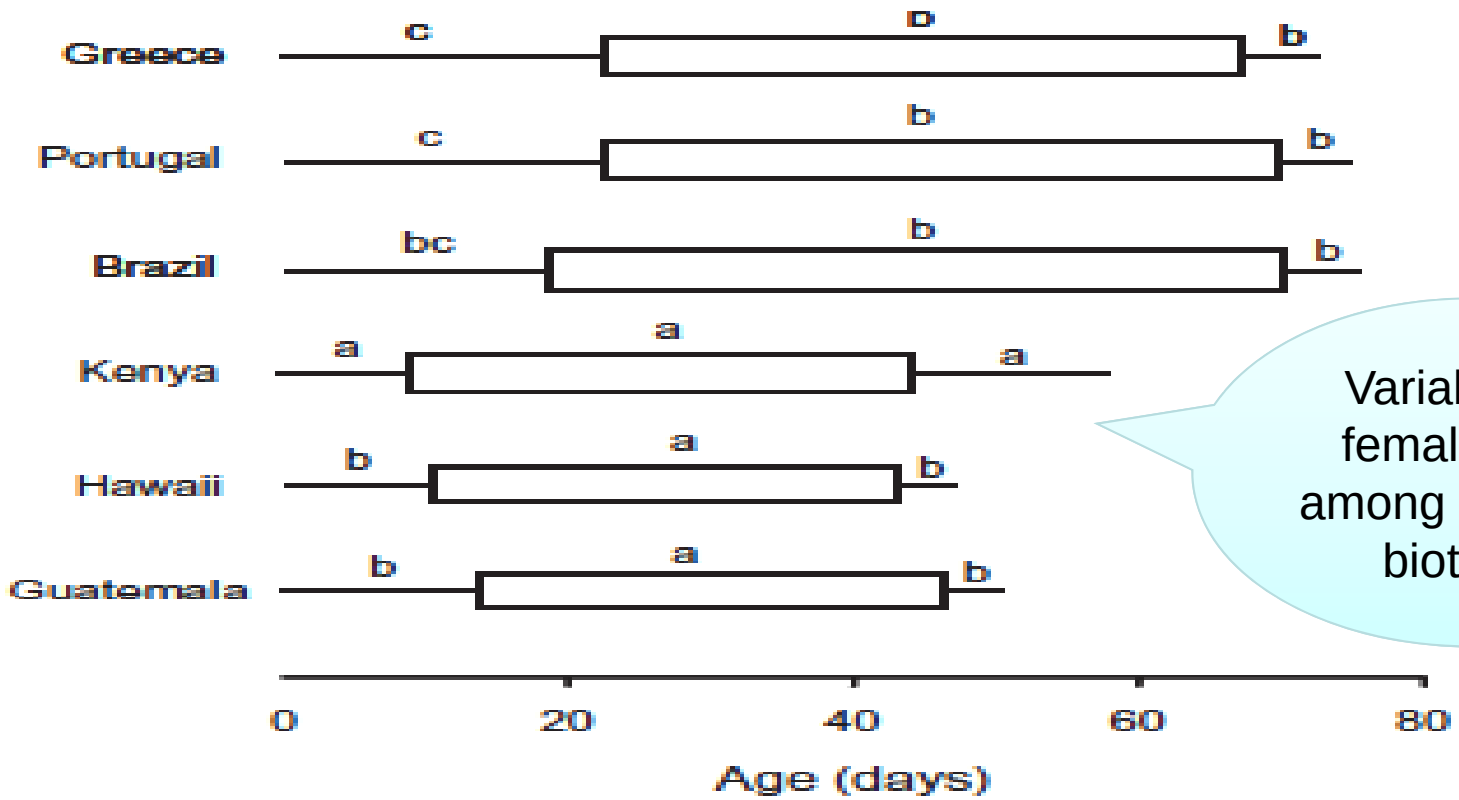
21.5

Papadopoulos and Katsoyannos 2002, unpublished data

Adult emergence, survival, and oviposition in field conditions



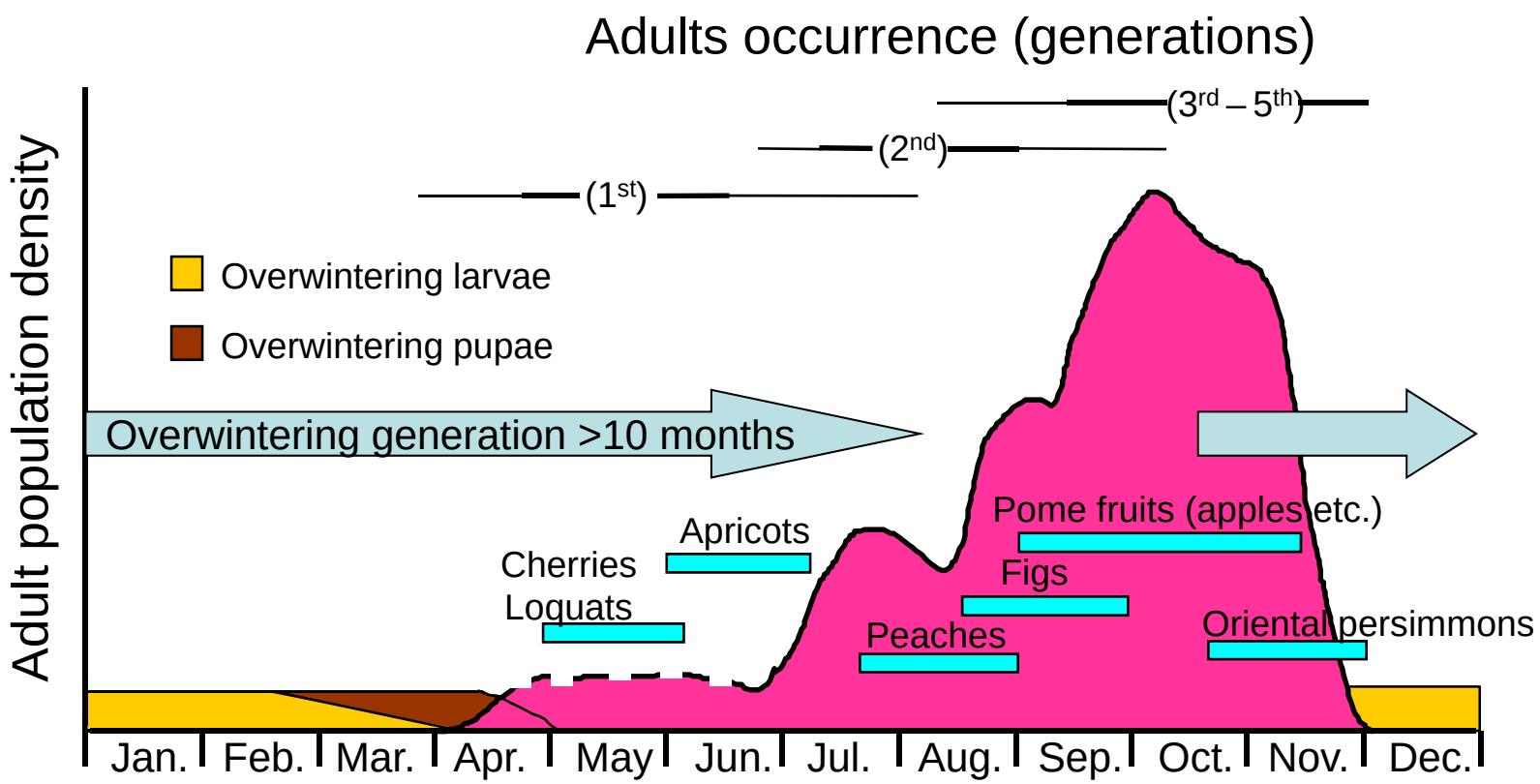
Variability in adult demographic traits



Variability in female traits among different biotypes

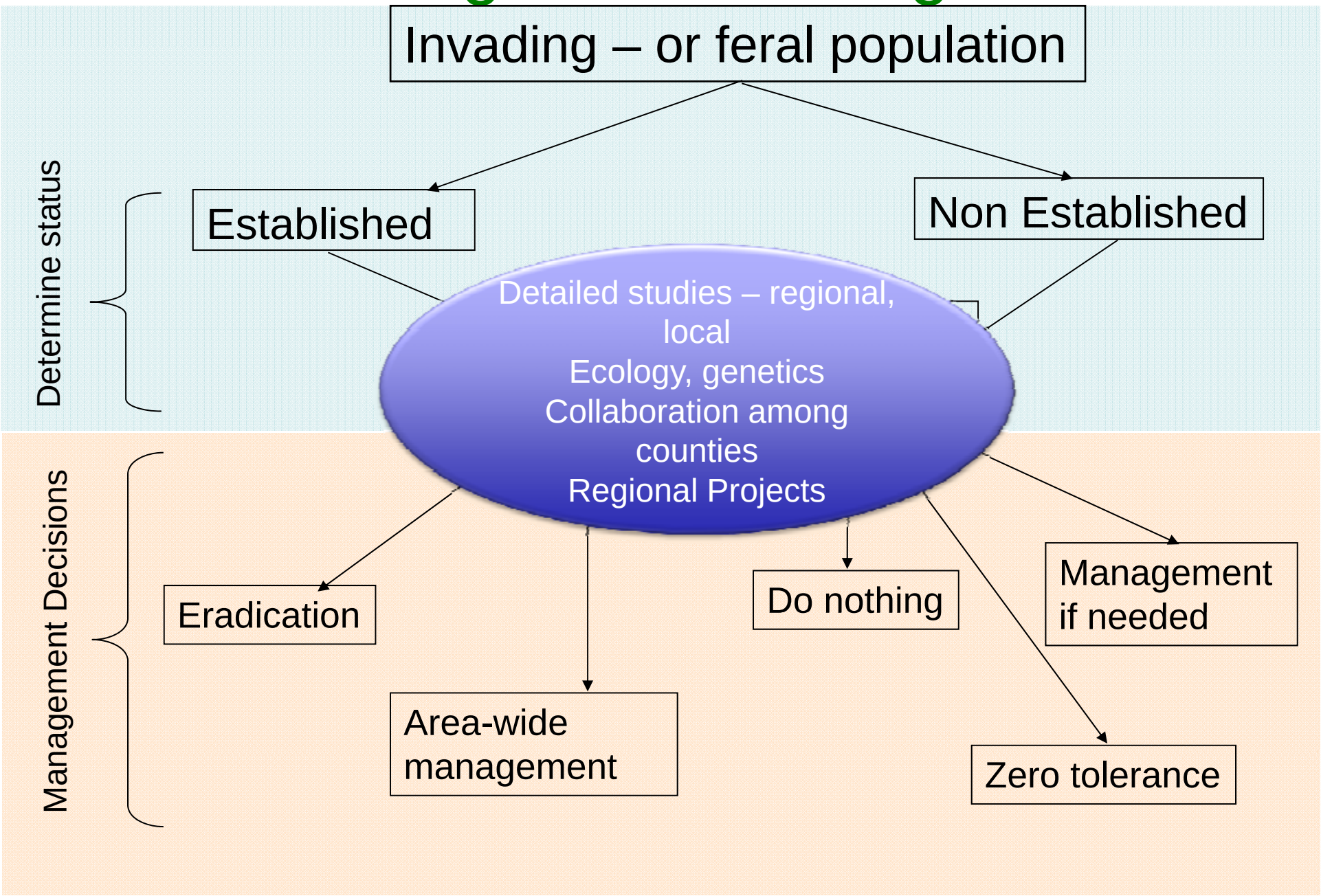
Diamantidis et al. 2009. Biological Journal of the Linnean Soc.

Model on medfly phenology in northern Greece



Modeling medfly phenology at different latitudes

Management strategies



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Thank you


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