

Διάλεξη 3

**Φαινόμενα εισβολής και προσαρμογής
φυσικών πληθυσμών**

(Κ. Ματθιόπουλος)



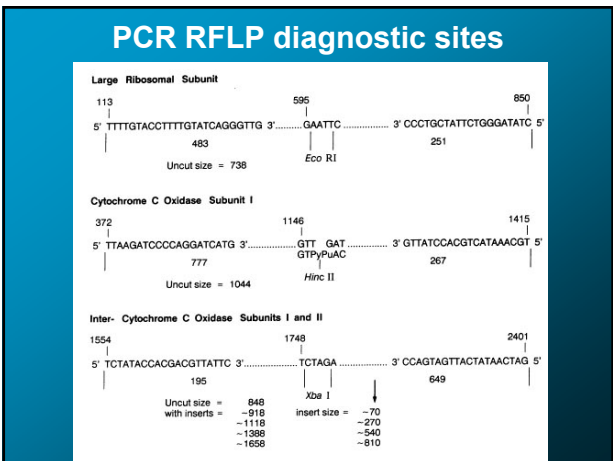
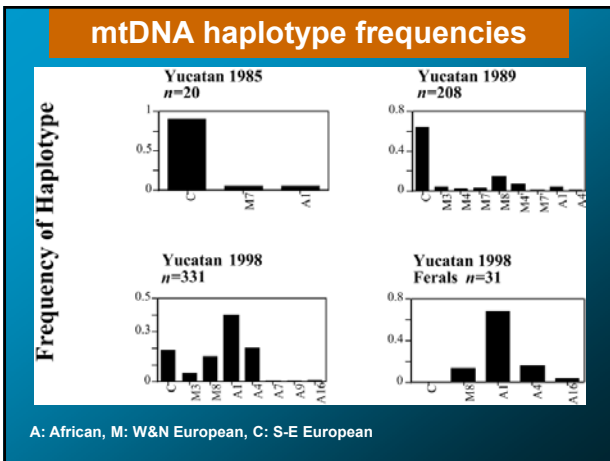
Η φυσική έκταση της *Apis mellifera*

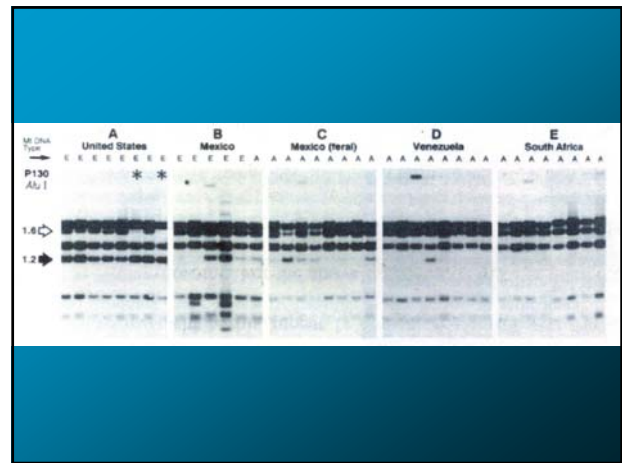
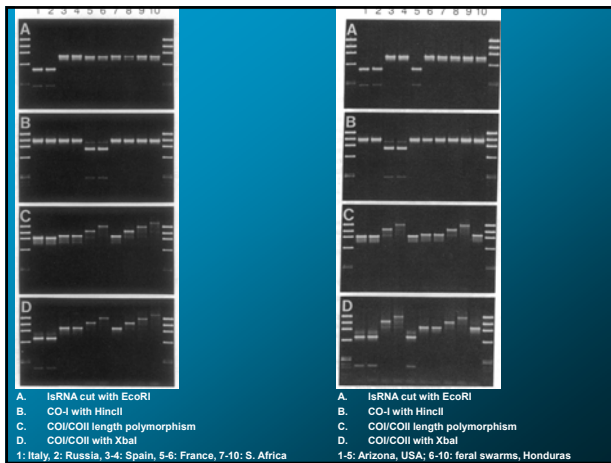
- Εκτείνεται από το βόρεια Ευρώπη μέχρι τη νότια Αφρική και από τα Βρετανικά νησιά μέχρι τα Ουράλια όρη, το δυτικό Ιράν και την Αραβική χερσόνησο.
- Η μελέτη των μιτοχονδριακών απλοτύπων αποκάλυψε 4 χαρακτηριστικές γραμμές:
 - Δυτικής Ευρώπης
 - Ανατολικής Ευρώπης
 - Αφρικής
 - Μέσης Ανατολής

- Before humans began large-scale transportation and mixing of *A. mellifera* populations, the four lineages were probably allopatric in distribution.
- At least three, and probably all four, mitochondrial lineages have been introduced into the New World:
 - The west European dominated 16th through 18th century introductions into N and S America
 - The east European lineage dominated subsequent introductions
 - N African lineages were also introduced and this was present at low frequency in feral N American population prior to the arrival of the African bee from Latin America.

Η αρχή της εφόδου

- From 1954 to 1955, beekeeping agencies, government departments and private beekeeping cooperatives in Brazil initiated projects to increase the low honey production of European colonies kept by commercial beekeepers.
- In 1956, WE Kerr traveled to Africa to select queens of the best stocks
- The nucleus formed by:
 - One of six queens from Tanganyika
 - 46 of 132 queens from Pretoria, S. Africa





- **mtDNA** → maternal ancestry
- **Paternal contribution to the history and pattern of gene flow?**
 - **Nuclear markers:**
 - allozymes
 - RAPDs
 - nuclear RFLPs
 - microsatellites

- ### Microsatellites
- 1985, compare sample from Yucatan (21) plus reference samples from Venezuela (28) with regard to microsatellite allele frequencies
 - Yucatan: East European
 - Venezuela: African / w European
 - 1998, new set of samples (312 colonies)
 - Yucatan: most were African / w European
 - only four were east European

- **Allele frequencies vs diagnostic alleles**
- **Mitochondrial haplotypes vs nuclear markers**

- ### Summary of molecular data
- When African bees first expand into a new location, both E and W European nuclear and mt markers are found in the feral population.
 - Within 5-10 years, African markers predominate.
 - East European markers decrease to <10%.
 - West European markers remain constant at 16-30%. This may suggest that:
 - West European markers have entered the African population during the initial introduction and then carried along during the invasion process
 - Despite the 50 years of contact, the African bees have mainly retained their genetic identity.

Factors contributing in the preservation of African characteristics

- Colony growth and swarming rates
- Negative heterosis in hybrid bees
- Mating advantages for African drones
- African-patriline advantages during queen replacement
- Dominance of African alleles
- Nest usurpation

Adaptation of natural olive fly populations

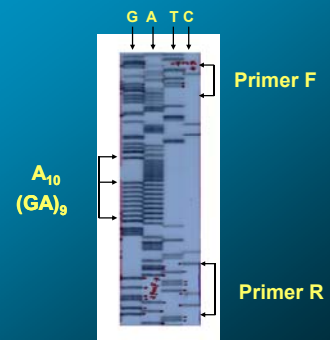


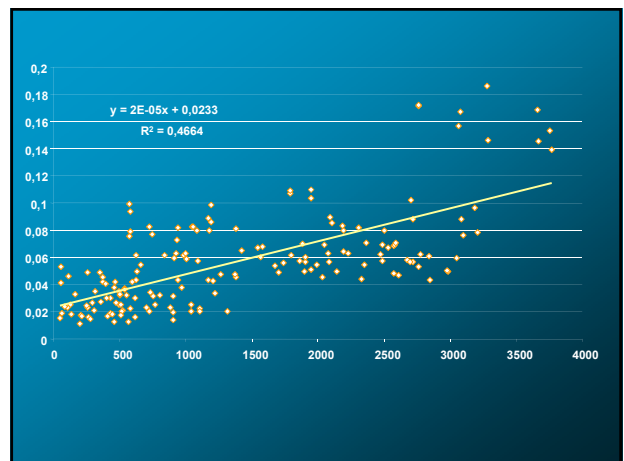
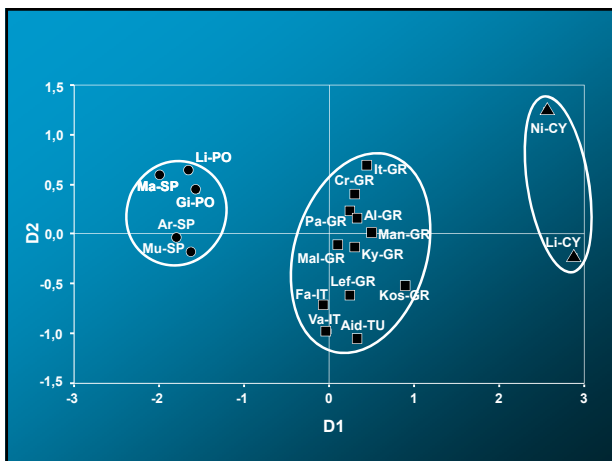
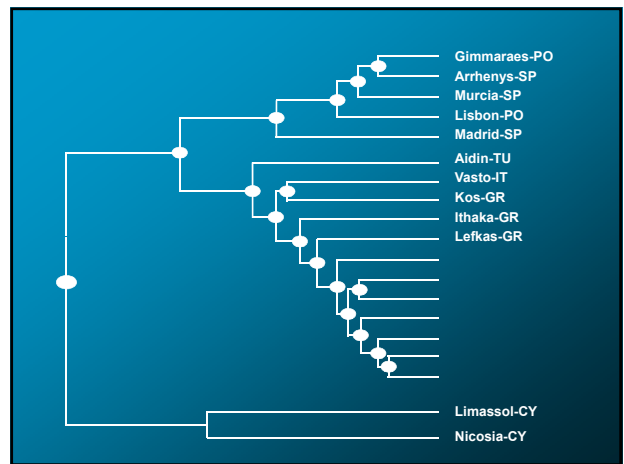
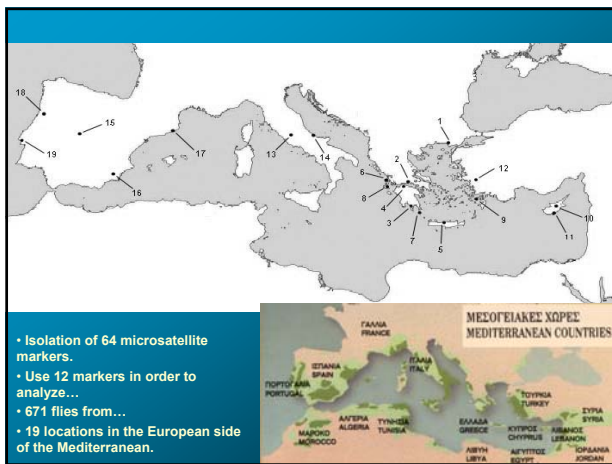
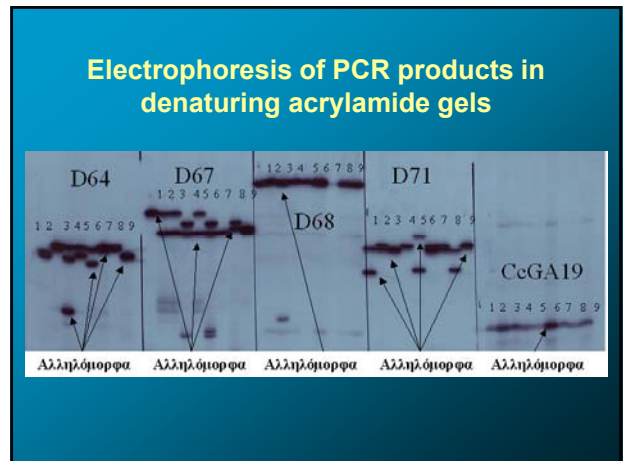
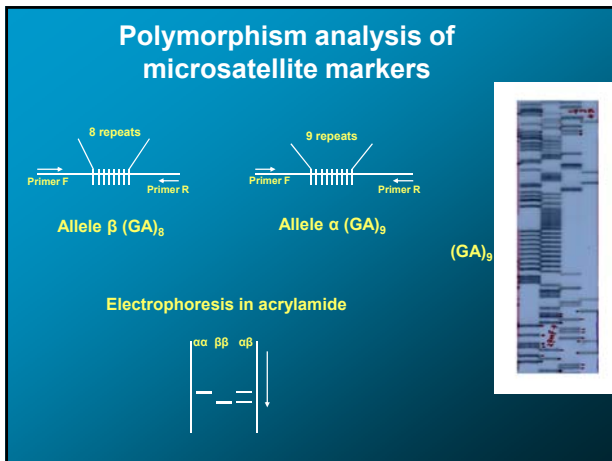
• 98% of olive trees are grown in the Mediterranean basin

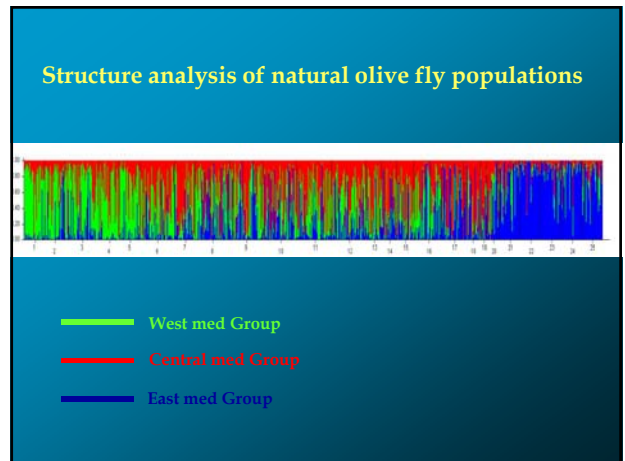
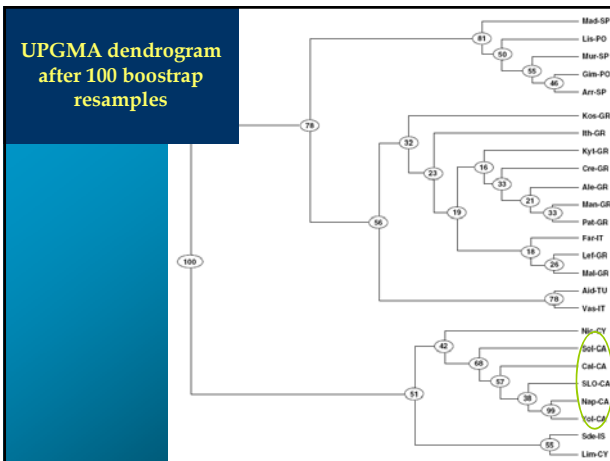
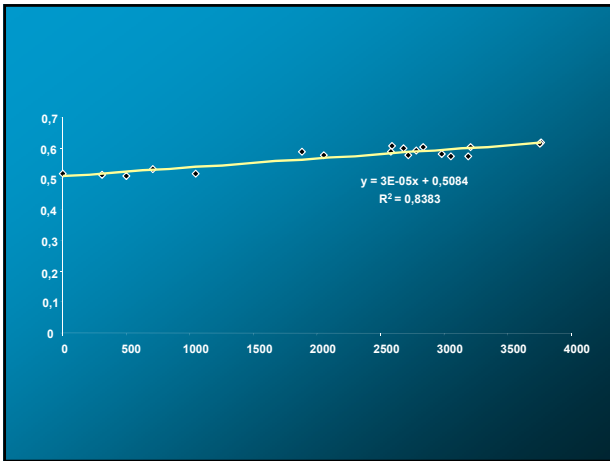
1. Analysis of olive fly populations – adaptation in nature and in laboratory conditions
2. Genome organization
3. Spread of insecticide resistance – Molecular mechanisms of resistance

1. Analysis of olive fly populations with the use of microsatellites

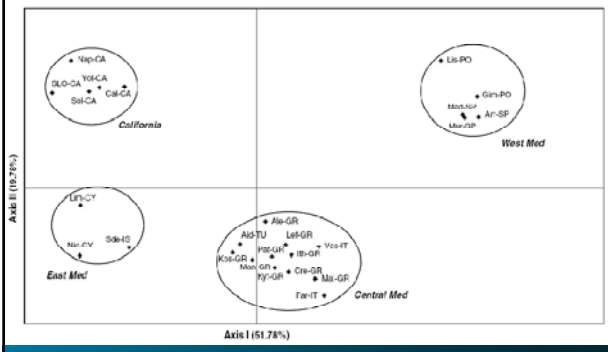
A complex microsatellite on an acrylamide gel







Principal Component Analysis of molecular variance. The first two axes explain 71.56% of



Conclusions I

- ✓ Higher genetic variability in California than in Iberia
- ✓ Private alleles in California that are not present in Iberia
- ✓ Most likely origin of California population is the East Mediterranean

Remaining questions

- ✓ Adaptation of invading population in the new environment
- ✓ Single or multiple invasions??



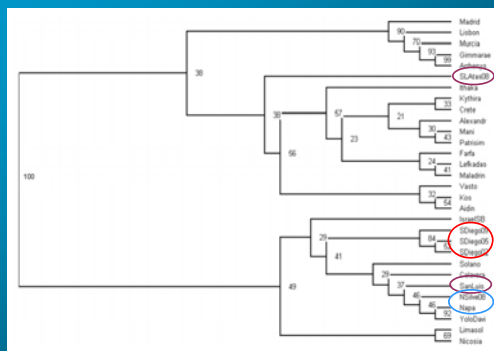
Diachronic sample analysis

Diachronic samples from California

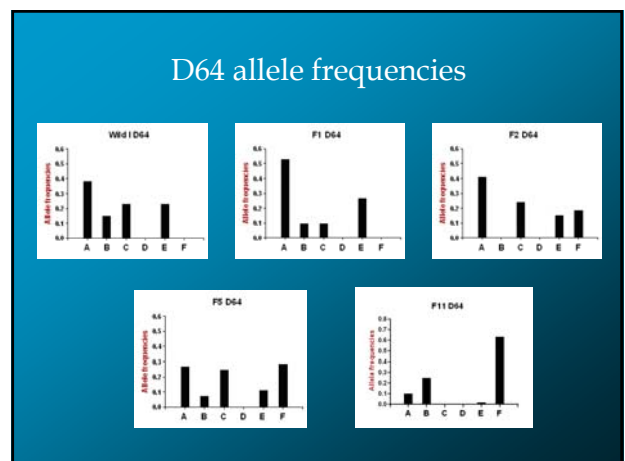
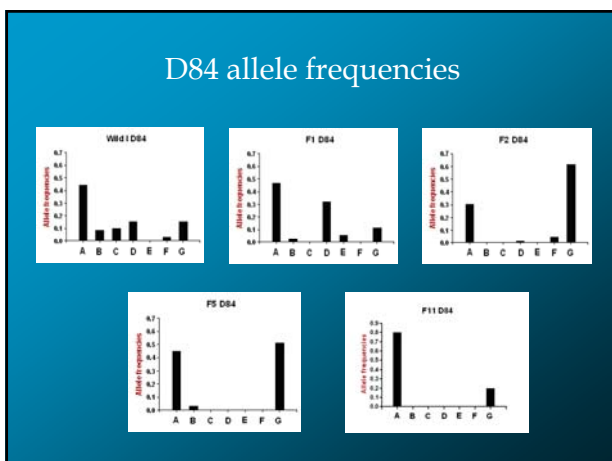
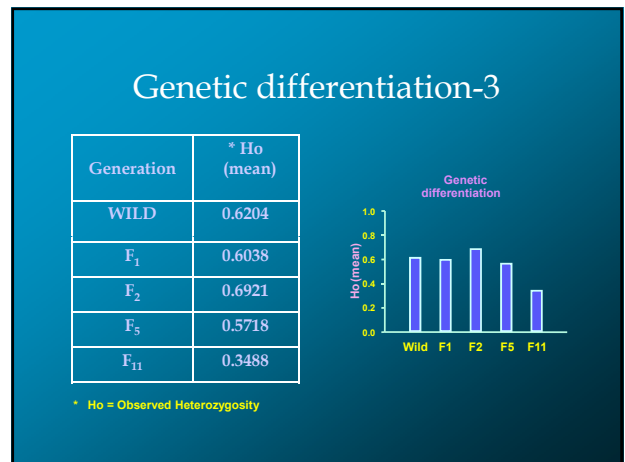
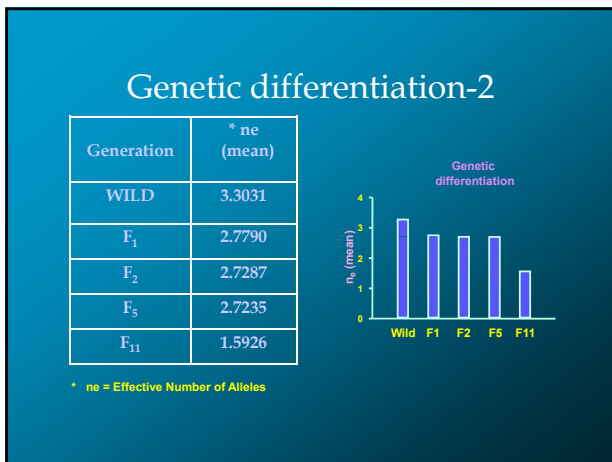
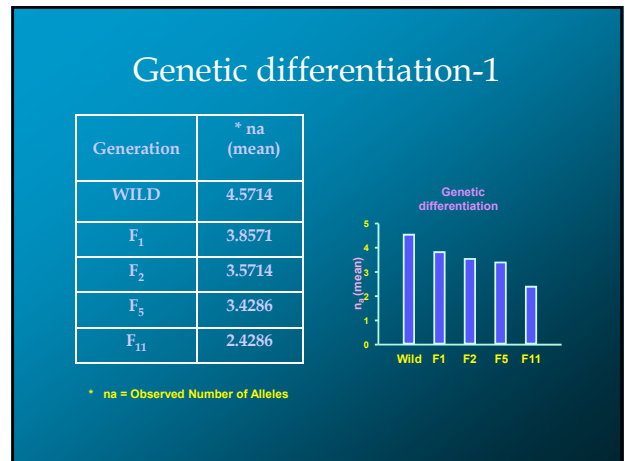
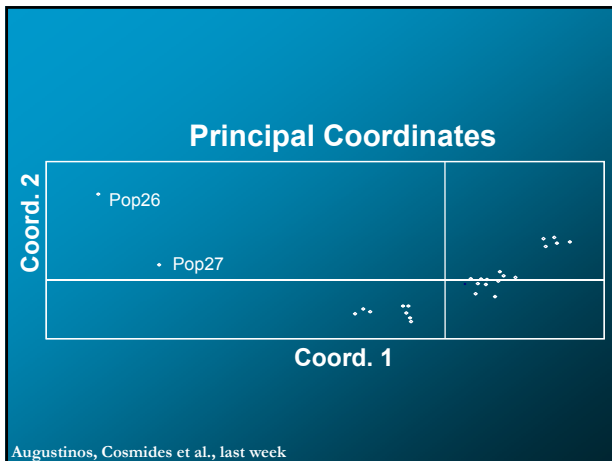


- San Luis Obispo 2004 & 2008
- San Diego 2002, 2005 & 2009

UPGMA dendrogram



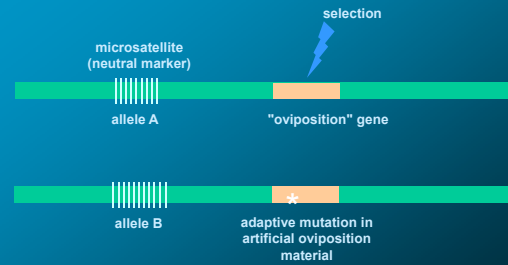
Adaptation in the laboratory



Conclusions-2

- Allele Frequency fluctuation
- Allele disappearance
- Allele fixation

What does disappearance or fixation of an allele mean?



- Allele B hitch-hikes with an adaptive mutation of a gene that favors oviposition in artificial material