INVASIVE SPECIES IN CATALONIA: TIGER MOSQUITO

OBJECTIVES
• Invasive species: what are they, causes of introduction and consequences.
• Actual situation in Catalonia: origin, repercussions and measures for tiger mosquito
• Alternative methods for its control.

INTRODUCTION
WHAT ARE THEY?
“Animals, plants or other organisms introduced by human in places out of their distribution area, where they establish and disperse creating a negative impact in ecosystem and local species”. Causes: trade, tourism or freight transport

IN CATALONIA
Impact in animal communities and biodiversity: largemouth bass, american mink, water velvet
1. in health: tiger mosquitoes & giant hogweed
2. in agriculture: red palm weevil & apple snail
3. in landscape: cactus pear...

THE TIGER MOSQUITO IN CATALONIA

DISTRIBUTION
Fig. 1. Distribution in Europe of A. Albopictus. Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5373307/

HABITAT & ACTIVITY
Where:
• Small dimensions
• Water
• >10d
Activity:
• May-Nov
• T>10 ºC

PERJUDICIAL EFFECTS
Quality of life
Sanitary risk:
• Dengue
• Yellow Fever
• Occidental Nil Fever
• Chikungunya Arthritis

GENOME
• Repetitive DNA
• Insecticide & detoxification resistance
• Diapause
• Similar sequences to flavivirus
Results in: success as invasive species

ACTUATION IN CATALONIA
1. Environmental surveillance: oviposition and adult traps
• Distribution study: presence areas, expansion and colonization
• Quantification of density in each zone
2. Control of the mosquito:
• Preventive measures: avoid egg laying and development of aquatic larvae
• Pesticide treatments: larvicides (adults)
3. Sanitary surveillance: surveillance of mosquito as a vector of diseases, measures to prevent mosquito bites and measures to take after bites.
4. Sensitization
5. Professional formation
6. Research

CONCLUSIONS
• The tiger mosquito is extended around the world. The most important problems that it causes are bites and health hazards.
• Measures in Catalonia: surveillance and control (pesticides)
• Pesticides: concerning of people, able to affect other populations and resistances of mosquitoes.
• Public opinion about GMO: variety of opinions. Concerns about uncontrolled expansion, hybridization, unknown disease transmission and resistances to insecticides, behaviour in wildlife and impact in the ecology of the insects.
• Proposed alternative methods could be a good tool for the control of invasive species as the tiger mosquito in the future.

ALTERNATIVE METHODS FOR THE CONTROL OF MOSQUITOES
1. Sterile Insect Technique
Application of ionizing irradiation to c
Dominant lethal mutations in sperm cells
Release males in nature → irradiated c x wild q
Death of zygotes during embryogenesis
2. Flightless female
Transcription factor tTAV just expressed in Q
Recognises promoter teto
Promoter teto initiates transp. of interest genes
Toxic proteins: no functional wings
3. Wolbachia infection
Manipulates reproduction host ➔
Genetic engineering:
• Incompatible Insect Technique
• Replacing of the population:
• Paratransgenesis, Popscreen effect, Disease blocking
4. Gene drive
Genetic engineering technology that can propagate a particular suite of genes throughout a population. These genes can be disseminated even though they are harmful for the host because they are inherited in a higher proportion than mendelian genes.
• Homing Endonuclease Genes (HEG)
HEG codes for an endonuclease
Endonuclease recognises & cuts DNA sequence
Reparation machinery uses HEG+ CHR as a copy
Introduces HEG into the other CHR ➔ 2 HEG+ alleles
• CRISPR Cas9
Similar to HEG mechanism but instead of protein (endonuclease)-DNA union it uses crRNA (CRISPR)-DNA union and endonuclease (Cas9) cuts DNA seq.
Function of HEG and CRISPR Cas 9: to interrupt, substitute or add a gene
Sex-ratio distortion:
• Express Cas9 in spermogenesis (under control of promoter β2 tubulin)
CRISPR Cas9 recognises and cuts specific sequence of the X CHR
Sperm cells will have Y CHR ➔ Descendants will be c

BIBLIOGRAPHY