PALMWATCH

Red palm weevil infestation detection with remote sensing

Susi Gómez Vives

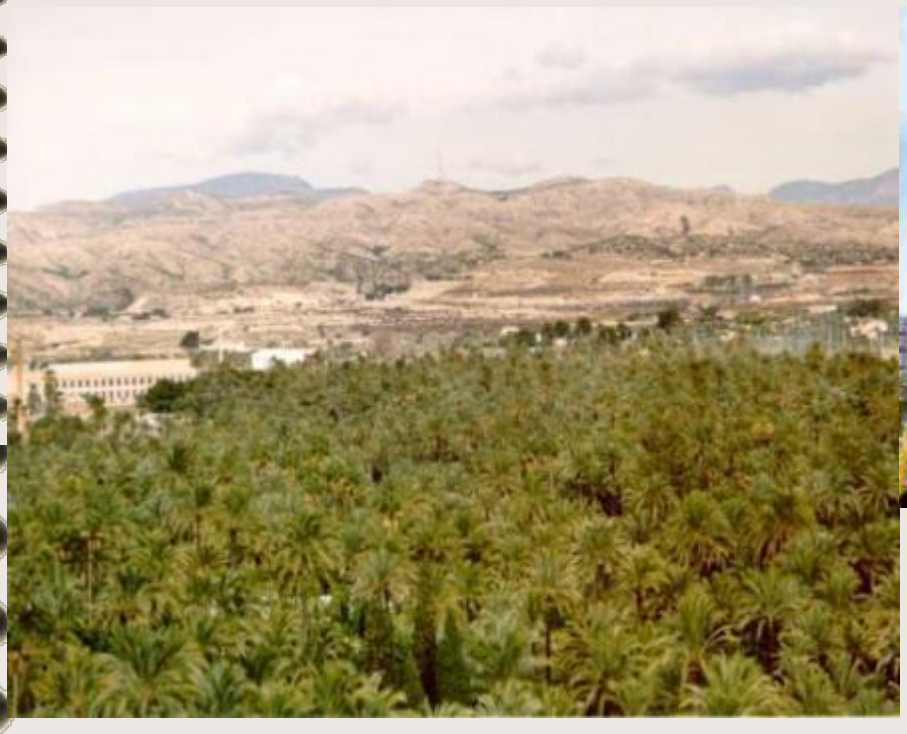
Michel Ferry

(Phoenix Research Station)

Estación Phoenix

The Phoenix Research Station

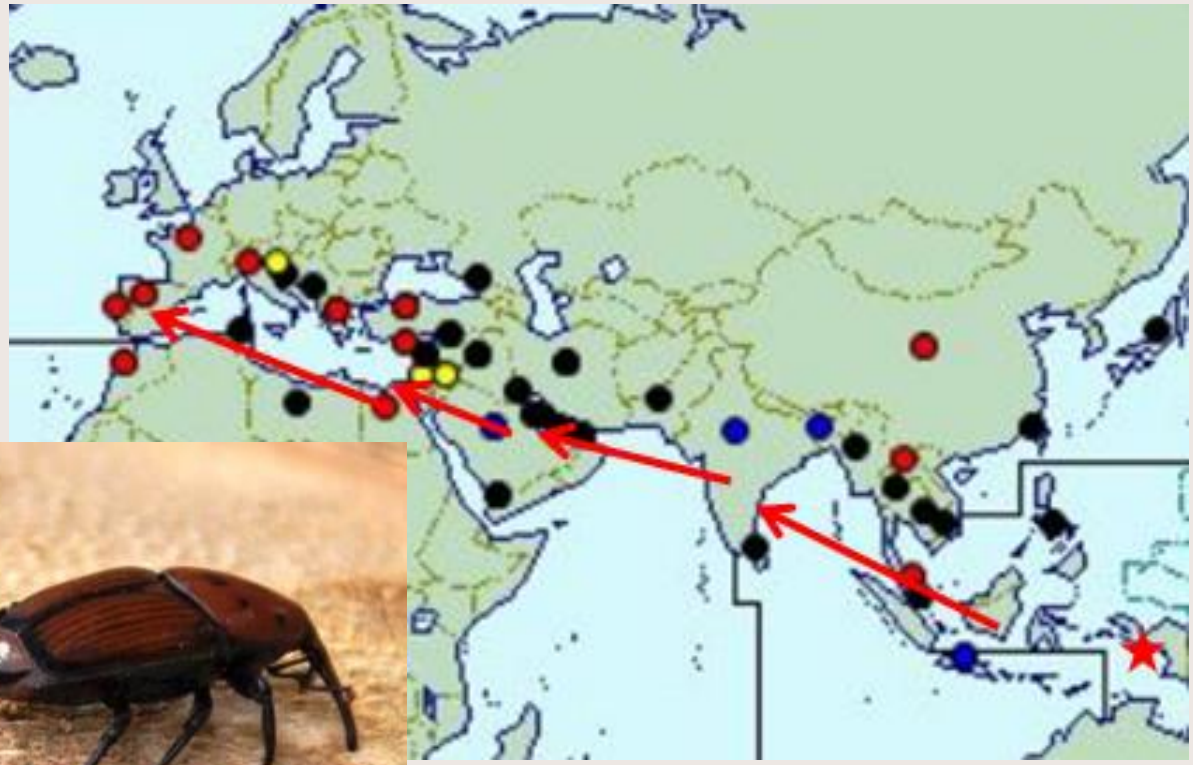
The unique European palm grove of Europe: inheritance of the Al Andalus period

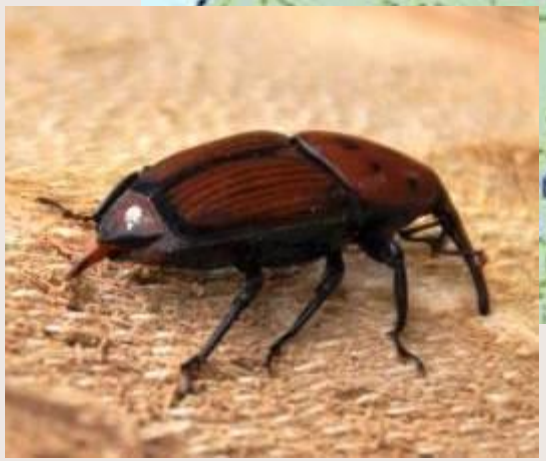


World heritage

Famous Palm Sunday procession with white palms

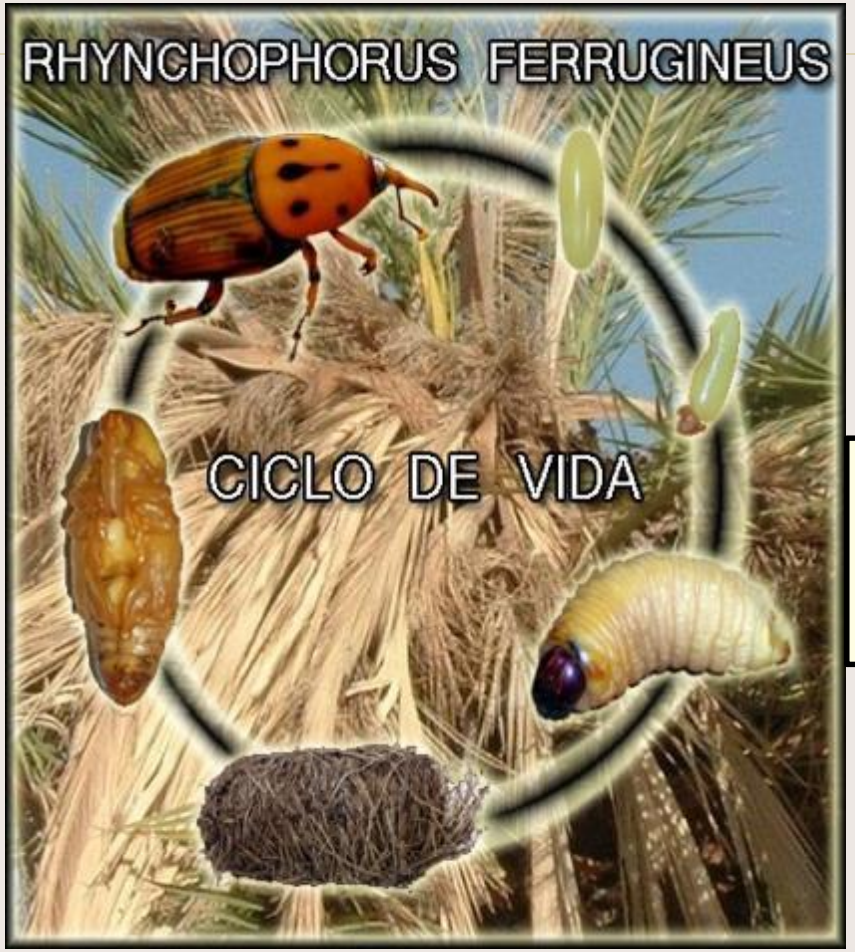
The trade of infested palms or ofshoots has spread the RPW from its region of origin (South-East Asia), to India (beginning 1900), to Middle East (mid 1980), to Egypt (1993), to South Europe (mid 2000), to North Africa (1998-2011)





Estación Phoenix

RPW cicle



Metamorfosis completa

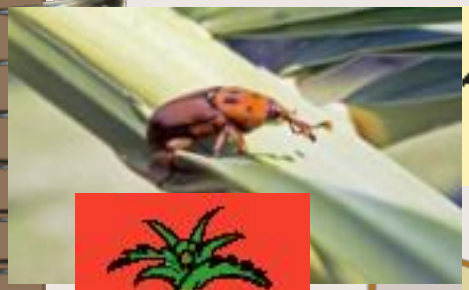
Se pueden encontrar a la vez todas las formas: huevos, larvas de diversos estadios, capullos y adultos

3 ó 4 ciclos al año

Estación Phoenix

Rhynchophorus ferrugineus adults

20 – 1.000 m



Female

SYNERGISTIC EFFECT

Kairomona of the plant

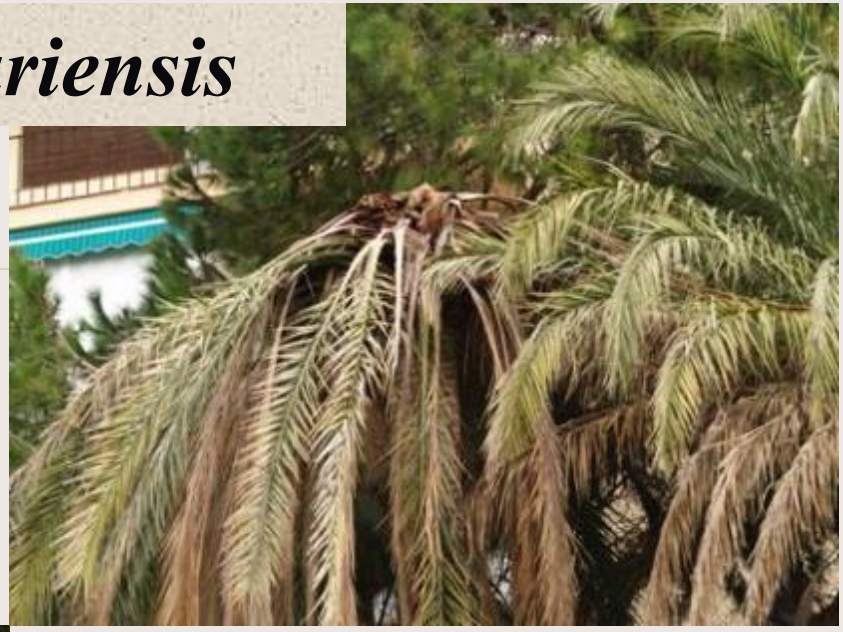
Aggregatión pheromone (male)

Endophages Larvae/ non- xylophages (feed on the sap)
Live and eat at the base of the leaves or in the trunk

Phoenix dactylifera

Estació Phoenix

Phoenix canariensis



Estación Phoenix

LONGEVIDAD et FECUNDIDAD DE LOS ADULTOS (Cabello et al.)

Parámetros		Temperatura (ºC)			
		20	25	30	35
Longevidad (días)	Hembra	200,1	151,2	75,8	75,8
	Macho	280,0	207,3	98,2	97,8
Periodos (días)	Pre-ovip.	9,2	7,3	13,9	6,7
	Oviposición	153,0	112,5	46,8	23,5
	Post-ovip.	43,4	26,0	13,7	44,6
Fecundidad (nº huevos/♀)		348,1	362,9	75,3	70,5
Fertilidad (nº larvas/♀)		255,8	282,4	43,0	30,6

Efecto de la temperatura sobre el desarrollo (Cabello et al.)

Estado	Desarrollo (días)				
	15ºC	20ºC	25ºC	30ºC	35ºC
Larva	457,0	203,6	90,3	70,2	72,4
Pupa	—	46,2	26,6	21,1	14,0
Total	—	245,9	117,0	90,1	86,4

Table 2. Life history of *R. ferrugineus* from different countries (duration in days)

Character	Country where study was conducted *					
	India	Indonesia	Myanmar	Philippines	Iran	Spain **
No. eggs/female	127-276	531	300	162-350	162-350	58-243
Incubation period	3-4	3	3-4	3	1-6	–
Larval period	25-61	60-105	30-105	35 male 38 female	41-78	76-102
Pupal period	18-33	13-17	17-50	11-19 male 12-19 female	15-27	19-45
Life cycle period	48-82	60	60-165	45-68 male 45-67 female	57-111	100-139
Longevity : male female	50-90 50-90	107 107	– –	63-109 39-72	39-72 20-120	– –

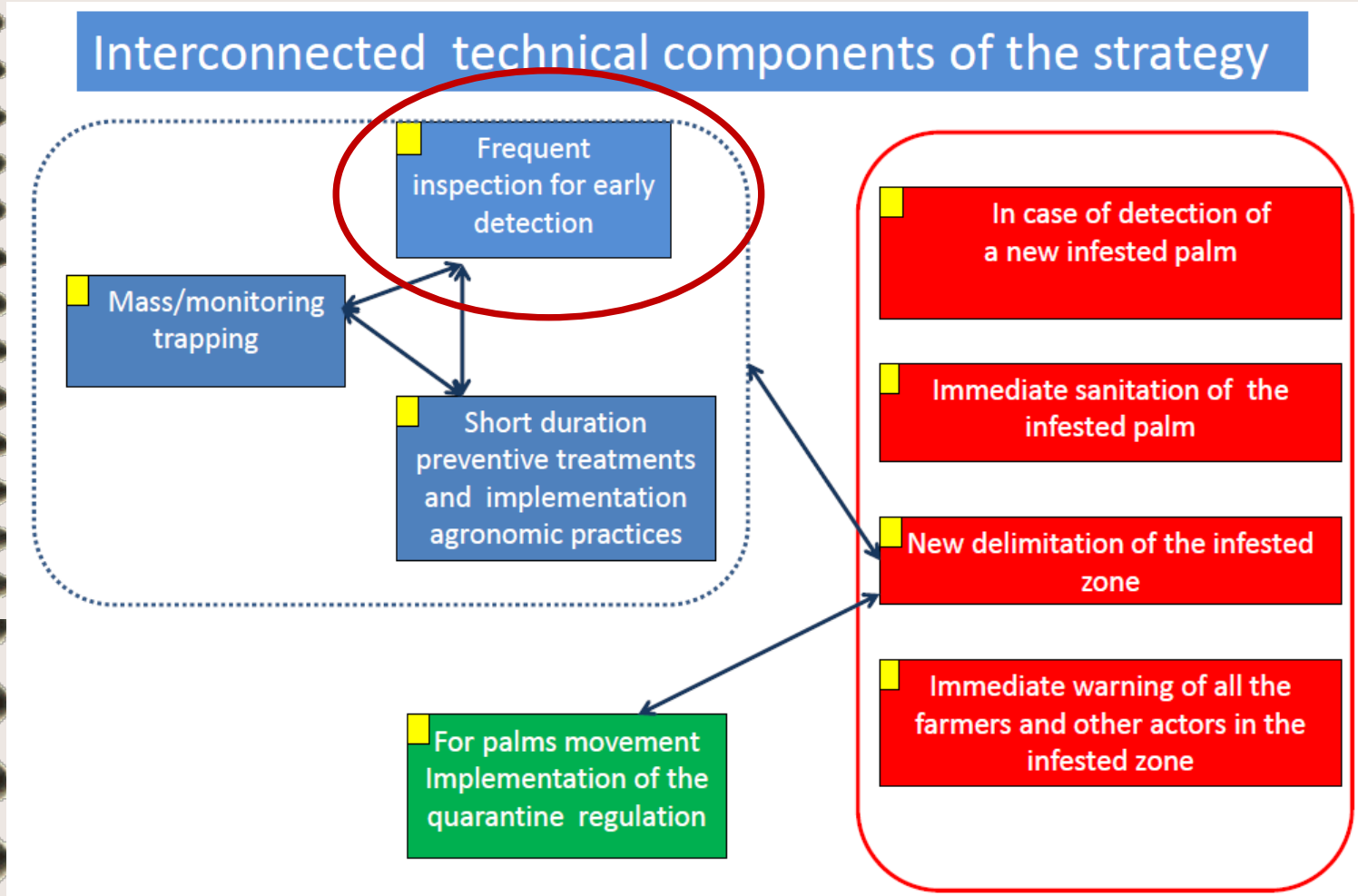
*As reported by Murphy and Briscoe (1999). **Esteban-Duran *et al.* (1998).

From Abraham 2002

RPW has a very strong multiplier potential

Estación Phoenix

The IPM strategy to control the RPW



All the activities are registered in a GIS conceived and used as a tool for daily management at the local, regional and national level

Estación Phoenix

Visual and contact detection

Frequent inspection for early detection

- Visual inspection is presently the only effective technique for early detection
- It is very efficient if inspections are frequent

In date palm, symptoms appear at the base.

In great Canary palms , symptoms appear at the crown level.

- The female likes low-light environment and fears dry and hot temperature conditions.
- It hides behind the petiole but also inside the infested tissues

The modalities of infestation inevitably create visible symptoms

Phoenix canariensis

Date palms

Inspecting is a hard work and the owners must be in the place regularly

RS could be an efficient solution for detecting infested palms and infested aereas

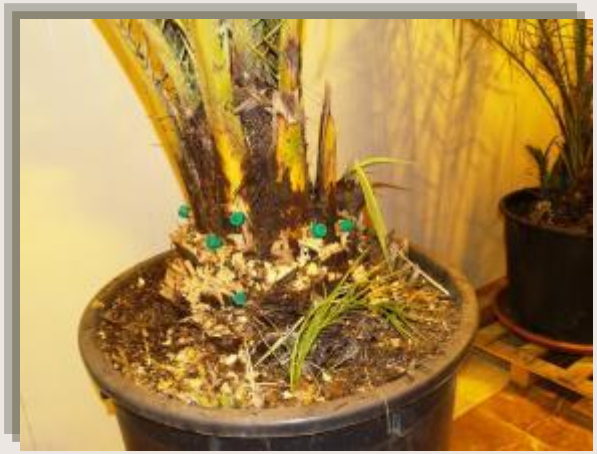
Pilot Trial (x 2): to check capacity of RS and determine what degree of infestation is able to detect.

- Controled infestation
- Protected reference palms
- Regular inspections
- Regular monitoring
  - spectral leaf measurements with portable ASD spectometer)
  - Hyperspectal images with Camera system (VariSpec)
- Airbone flights
  - July and Novembre 2019
  - April, July and Octobre 2020
  - March and July 2021

Pilot Trial : controled infestation,
Trapping system

Pilot Trial : controled infestation,

Rearing larvae and introducing the larvae in the palm



Palm nurseries for model development and validation

GRACIAS