

Transboundary Plant Insect Pests and Plant Pathogens: Current Status and Future Threats



Prof. Bouzid NASRAOUI



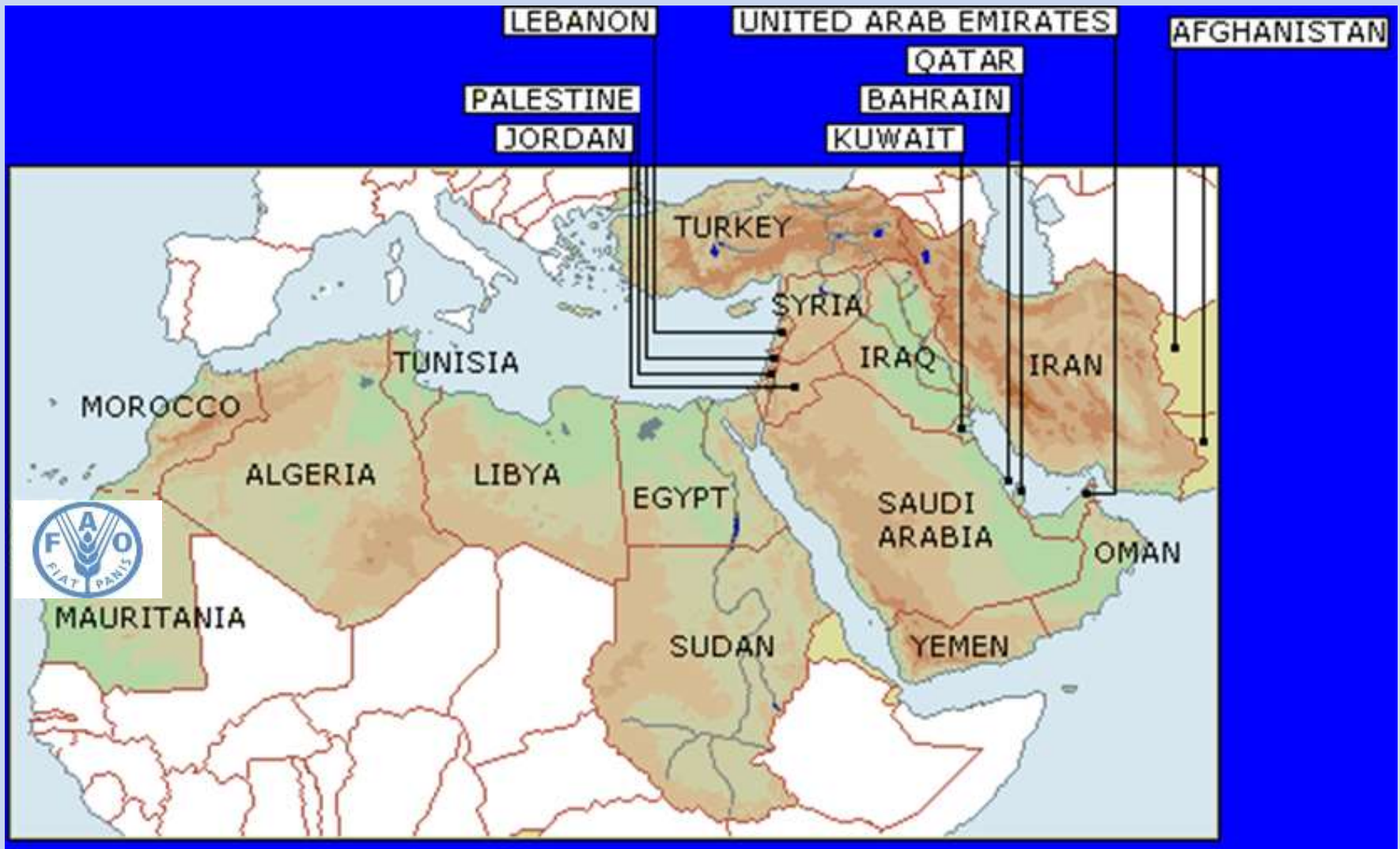
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NENA Countries



NENA Countries: **Common Phytosanitary Problems**

Plant Diseases

Cereal Rusts

(*Puccinia* spp.)



Stem Rust
(*Puccinia graminis*)



Yellow Rust
(*Puccinia striiformis*)



Wheat Stem Rust

(*Puccinia graminis*)



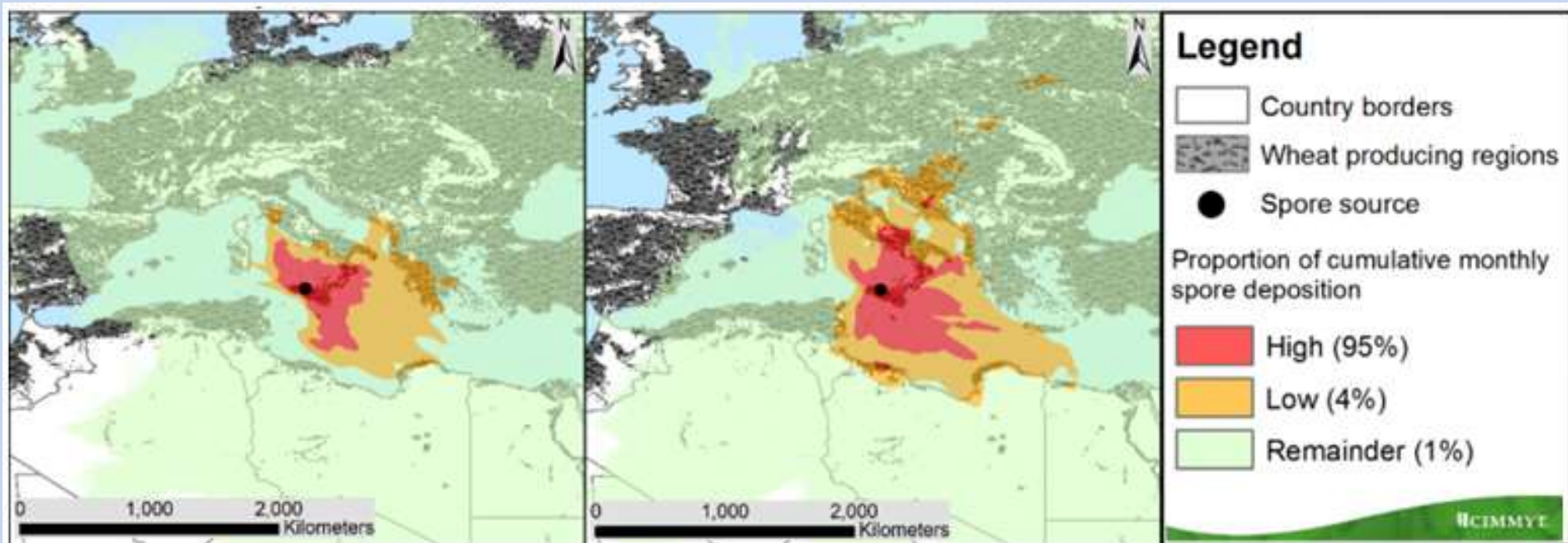
Wheat Stem Rust

(*Puccinia graminis*)



Wheat Stem Rust

(*Puccinia graminis*)



Risk of wheat stem rust in 2017 following outbreaks on Sicily in 2016.

Wheat Yellow Rust

(*Puccinia striiformis*)



Wheat Rusts

(*Puccinia* spp.)

Since 2008: **FAO**

 coordinates

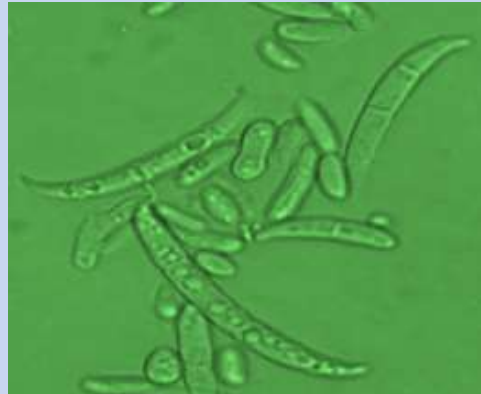
The **Wheat Rust Diseases Global Program (WRDGP)**

 provides

Policy and technical support to the concerned countries

Panama Disease of Banana

(*Fusarium oxysporum* f. sp. *cubense*)



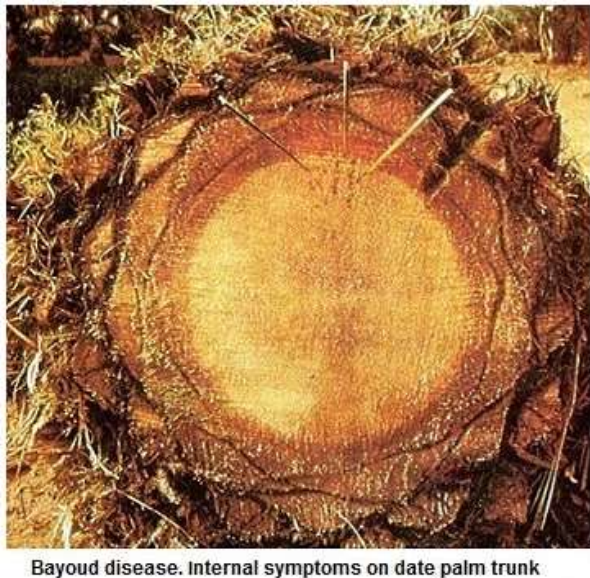
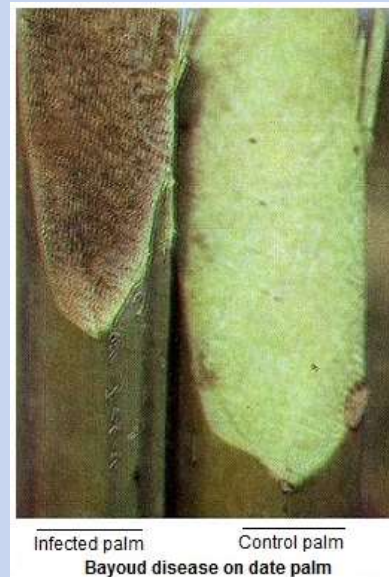
Panama Disease of Banana

(*Fusarium oxysporum* f. sp. *cubense*)



Bayoudh of Date Palm

(*Fusarium oxysporum* f. sp. *albedinis*)



Bayoudh of Date Palm

(*Fusarium oxysporum* f. sp. *albedinis*)



Bayoud disease. External symptoms on date palms



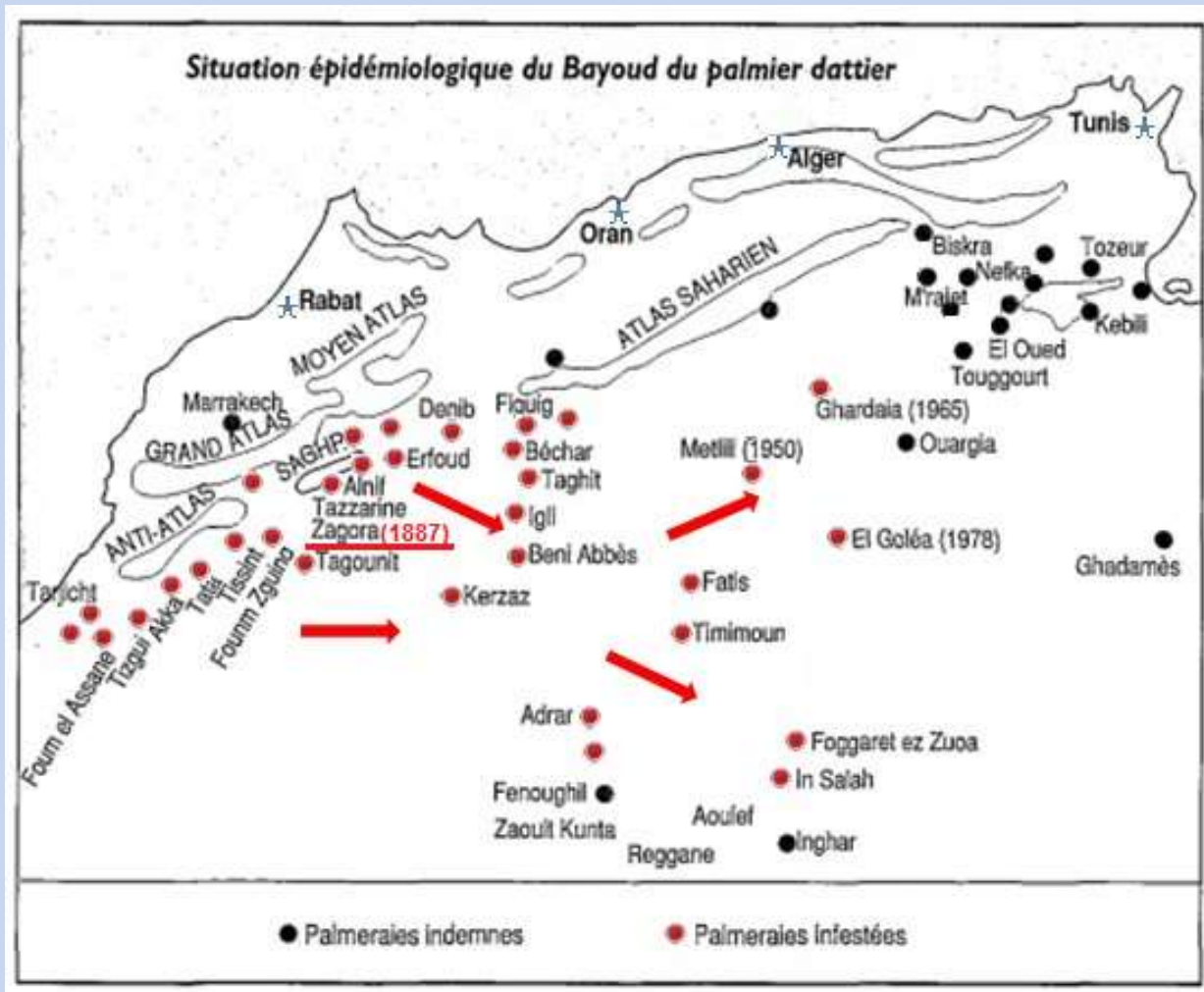
Bayoudh of Date Palm

(Fusarium oxysporum f. sp. albedinis)

- * **Bayoudh**: means "**Whitening**" (of the leaves of the infected palms)
- * **First observation in Morocco: Zagora 1887**
- * **During more than 1 century, destruction of:**
 - **10 Million palm trees in Morocco (2/3)**
[Morocco became date importer]
 - **03 Million palm trees in Algeria (1/3)**

Bayoudh of Date Palm

(*Fusarium oxysporum* f. sp. *albedinis*)



Threatened:

- Mauritania
- East-Algeria
- Tunisia
- Libya

Bayoudh of Date Palm

(*Fusarium oxysporum* f. sp. *albedinis*)



Citrus Witch's Broom Disease

(*Candidatus Phytoplasma aurantifolia*)



Citrus Witch's Broom Disease

(*Candidatus Phytoplasma aurantifolia*)



Pome Fruit Fire Blight

(*Erwinia amylovora*)



Pome Fruit Fire Blight

(*Erwinia amylovora*)



Propagation in tree

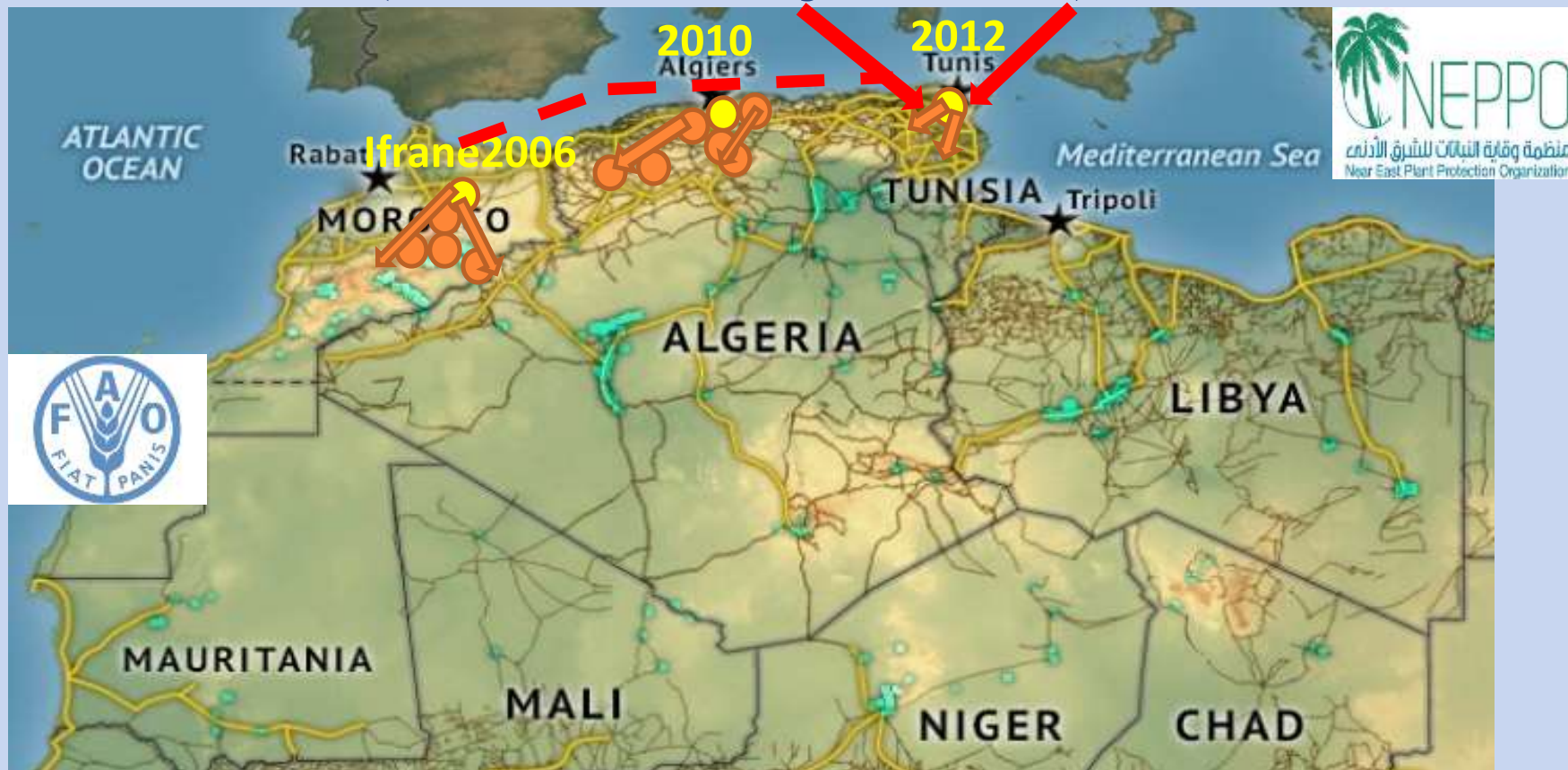


Propagation between trees (Windy rains, Bees, Man pruning,...)



Pome Fruit Fire Blight

(*Erwinia amylovora*)



Tunisia / Surface of Rooted out Trees : 3,300 ha (2016)

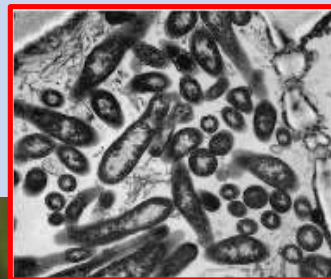
Pome Fruit Fire Blight

(*Erwinia amylovora*)



Citrus Greening

(*Candidatus Liberibacter*)



Citrus Greening

(*Candidatus Liberibacter*)



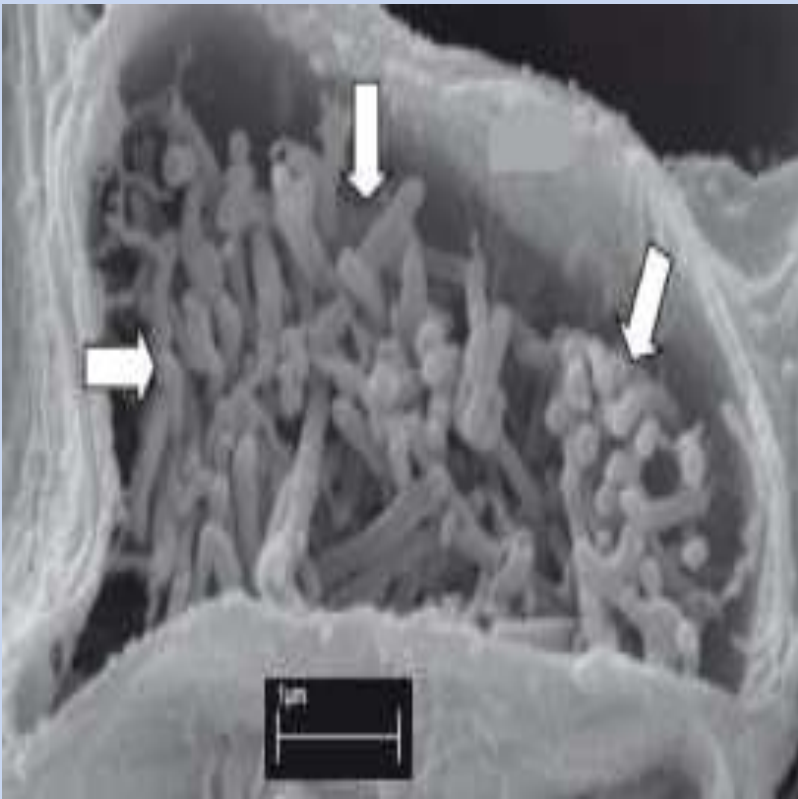
Citrus Greening/HLB

(‘*Candidatus Liberibacter*’)

- * Disease firstly observed in China 1956, then called: *Huang-Long-Bing* (HLB), meaning **Yellow Shoot Disease**
- * Known also as **Greening** disease
- * Bacteria transmitted by rootstock, graft and sap-sucking insects feeding on citrus

Citrus Greening/HLB

(‘*Candidatus Liberibacter*’)



* Three species of bacteria:

- ‘*Cand. Liberibacter asiaticus*’
- ‘*Cand. Liberibacter africanus*’
- ‘*Cand. Liberibacter americanus*’

* They are injected in citrus plants by insect pests

* They locate and spread in liber tissue of the citrus phloem

Citrus Greening/HLB

(‘*Candidatus Liberibacter*’)

Vector insect

African psyllid
(*Trioza erytreae*)



‘*Ca. Liberibacter*
africanus’



Citrus Greening/HLB

(‘*Candidatus Liberibacter*’)



Vector insect

Asian psyllid
(*Diaphorina citri*)



‘*Ca. Liberibacter
asiaticus*’
and
‘*Ca. Liberibacter
americanus*’

Citrus Greening/HLB

(*Candidatus Liberibacter*)

'Cand. Liberibacter africanus'

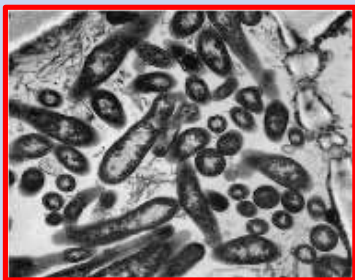


CABI Map

Citrus Greening/HLB

(*Candidatus Liberibacter*)

Cand. Liberibacter asiaticus



Citrus Greening/HLB

(*Candidatus Liberibacter*)

Cand. Liberibacter americanus



Citrus Greening/HLB

(*Candidatus Liberibacter*)

Trioza erytreae (African citrus psyllid vector)



Citrus Greening/HLB

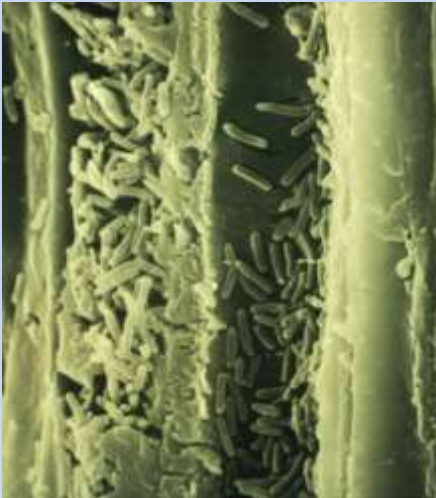
(*Candidatus Liberibacter*)

Diaphorina citri (Asian citrus psyllid vector)



Xylella Diseases

(*Xylella fastidiosa*)



* One species of bacterium living in xylem vessels: *Xylella fastidiosa*

* Many subspecies:

- *X. fastidiosa* subsp. *fastidiosa*

- *X. fastidiosa* subsp. *multiplex*

- *X. fastidiosa* subsp. *pauca*

- *X. fastidiosa* subsp. *sandyi*

and

- *X. fastidiosa* subsp. *morus* changed in 2016 in a new species: *Xylella taiwanensis*

Xylella Diseases

(Xylella fastidiosa)

Xylella fastidiosa causes several diseases on numerous host plants (around 350 plant species):

- **Grapevine** Pierce's disease (PD)
- **Citrus** variegated chlorosis (CVC)
- Phony **peach** disease (PPD)
- **Oleander** leaf scorch (OLS)
- **Plum** leaf scald (PLS)
- **Almond** leaf scorch (ALS)
- **Coffee** leaf scorch (CLS)
- **Olive** quick decline (OQD),...
- + **A number of forest and shade trees**

Xylella Diseases

(Xylella fastidiosa)

Xylella fastidiosa is transmitted by numerous (around 40 species) sap-sucking insects belonging to Hemiptera (Cicadellidae & Cercopidae).

Examples of **Cicadellidae** vectors



Xyphon fulgida



Homalodisca vitripennis

Xylella Diseases

(Xylella fastidiosa)

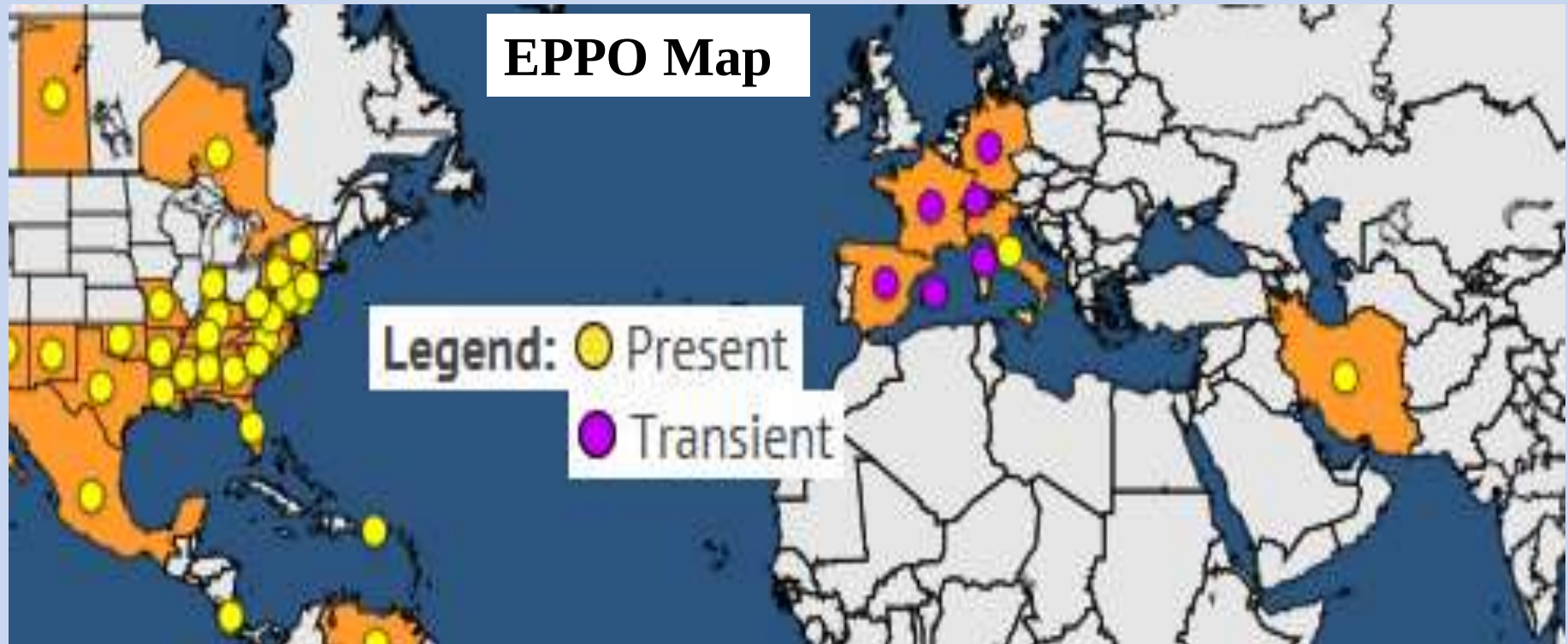
Example of **Cercopidae** vector



Philaenus spumarius

Xylella Diseases

(Xylella fastidiosa)



Xylella Diseases

(Xylella fastidiosa)

Grapevine Pierce's Disease (PD)

Caused by *X. fastidiosa* subsp. *fastidiosa*



Xylella Diseases

(Xylella fastidiosa)

Grapevine Pierce's Disease (PD)

Caused by *X. fastidiosa* subsp. *fastidiosa*



Xylella Diseases

(Xylella fastidiosa)

Citrus Variegated Chlorosis (CVC)
Caused by *X. fastidiosa* subsp. *pauca*



Xylella Diseases

(Xylella fastidiosa)

Phony Peach Disease (PPD)

Caused by *X. fastidiosa* subsp. *multiplex*



Xylella Diseases

(*Xylella fastidiosa*)

Oleander Leaf Scorch (OLS)

Caused by *X. fastidiosa* subsp. *sandyi*



Xylella Diseases

(*Xylella fastidiosa*)

Oleander Leaf Scorch (OLS)

Caused by *X. fastidiosa* subsp. *sandyi*



Xylella Diseases

(Xylella fastidiosa)

Almond Leaf Scorch (ALS)

Caused by *X. fastidiosa* subsp. *fastidiosa*
and *X. fastidiosa* subsp. *multiplex*

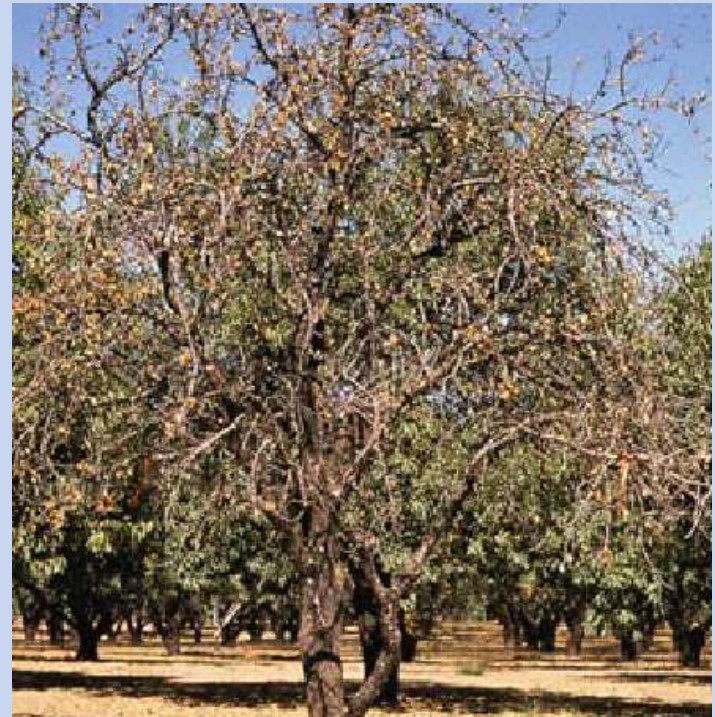


Xylella Diseases

(Xylella fastidiosa)

Almond Leaf Scorch (ALS)

Caused by *X. fastidiosa* subsp. *fastidiosa*
and *X. fastidiosa* subsp. *multiplex*



Xylella Diseases

(*Xylella fastidiosa*)

Olive Quick Decline (OQD)

Caused by *X. fastidiosa* subsp. *pauca*



Xylella Diseases

(*Xylella fastidiosa*)

Olive Quick Decline (OQD)

Caused by *X. fastidiosa* subsp. *pauca*



Xylella Diseases

(*Xylella fastidiosa*)

Olive Quick Decline (OQD)

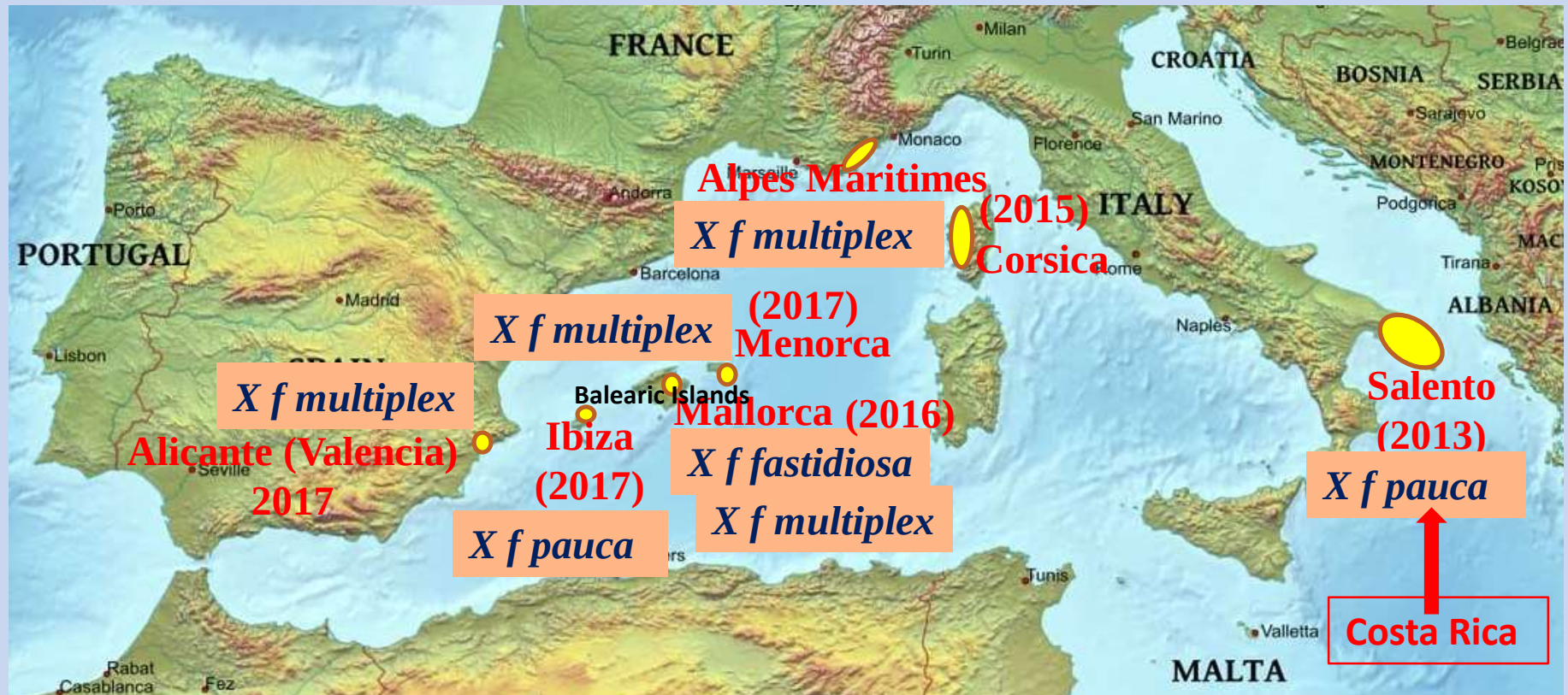
Caused by *X. fastidiosa* subsp. *pauca*



Italy: 200,000 ha of olive trees attacked (until 2017)

Xylella Diseases

(Xylella fastidiosa)



NENA Countries: Common Phytosanitary Problems

Plant Insect Pests

Desert Locust

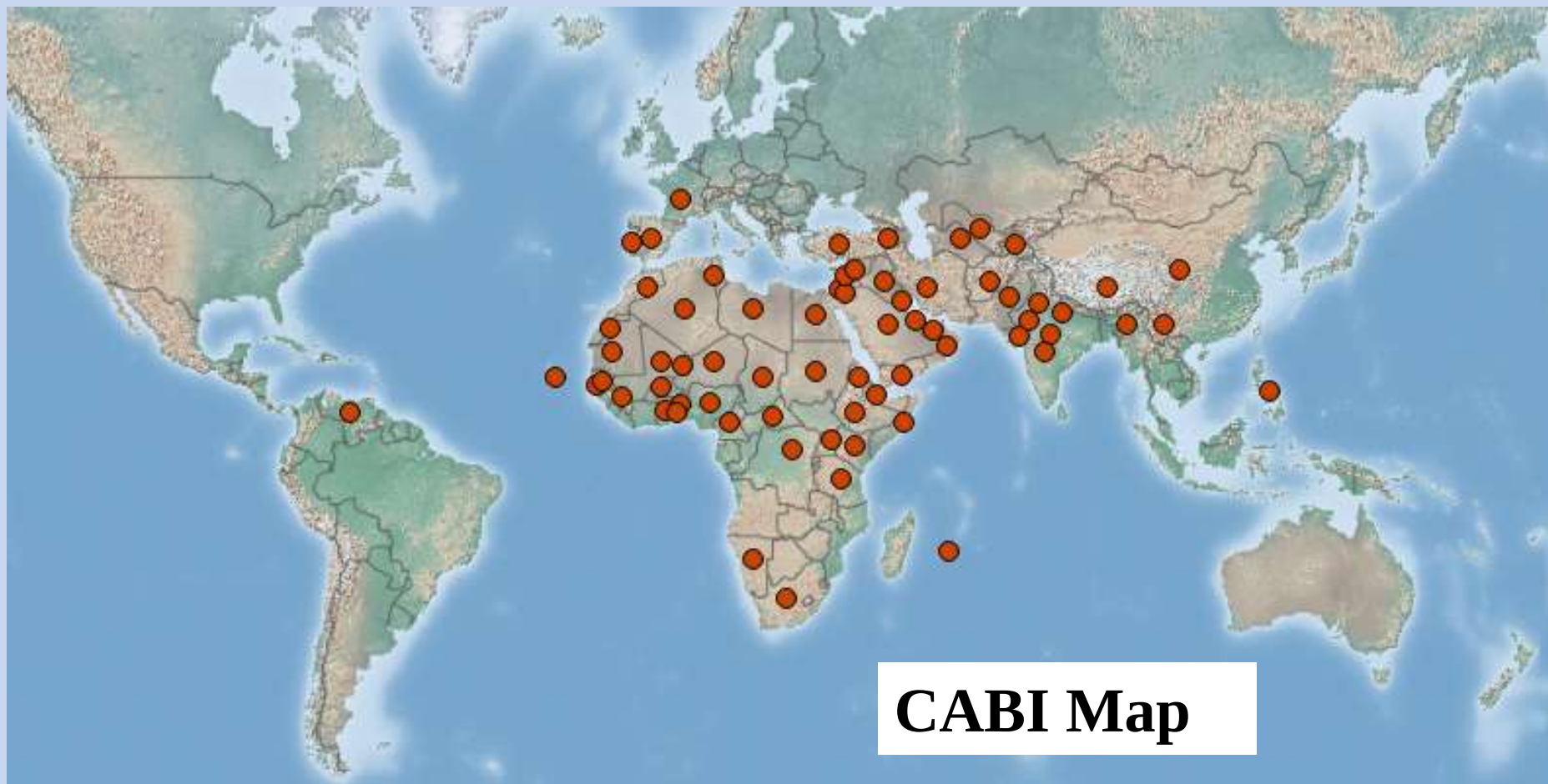
(*Schistocerca gregaria*)





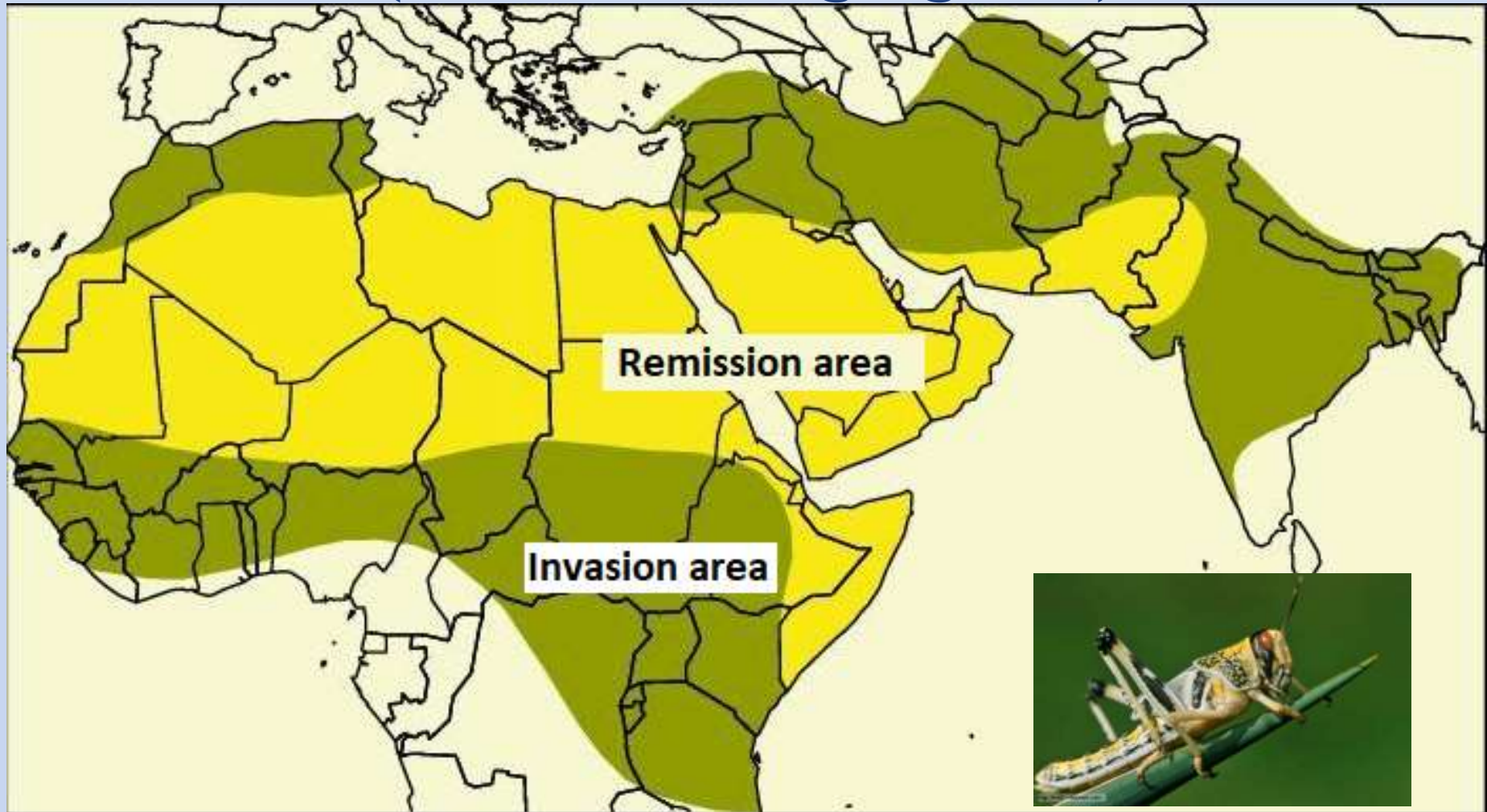
Desert Locust

(*Schistocerca gregaria*)



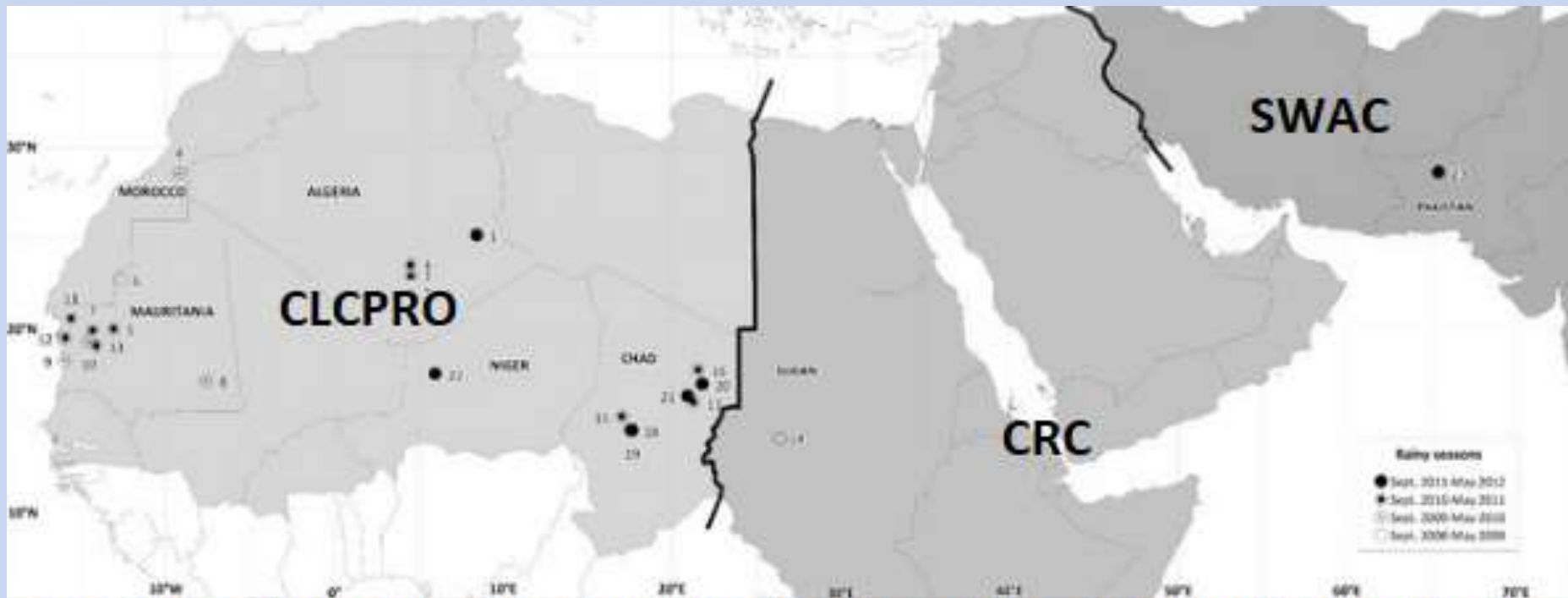
Desert Locust

(*Schistocerca gregaria*)



Desert Locust

(*Schistocerca gregaria*)



CLCPRO: Commission for Controlling the Desert Locust in the Western Region

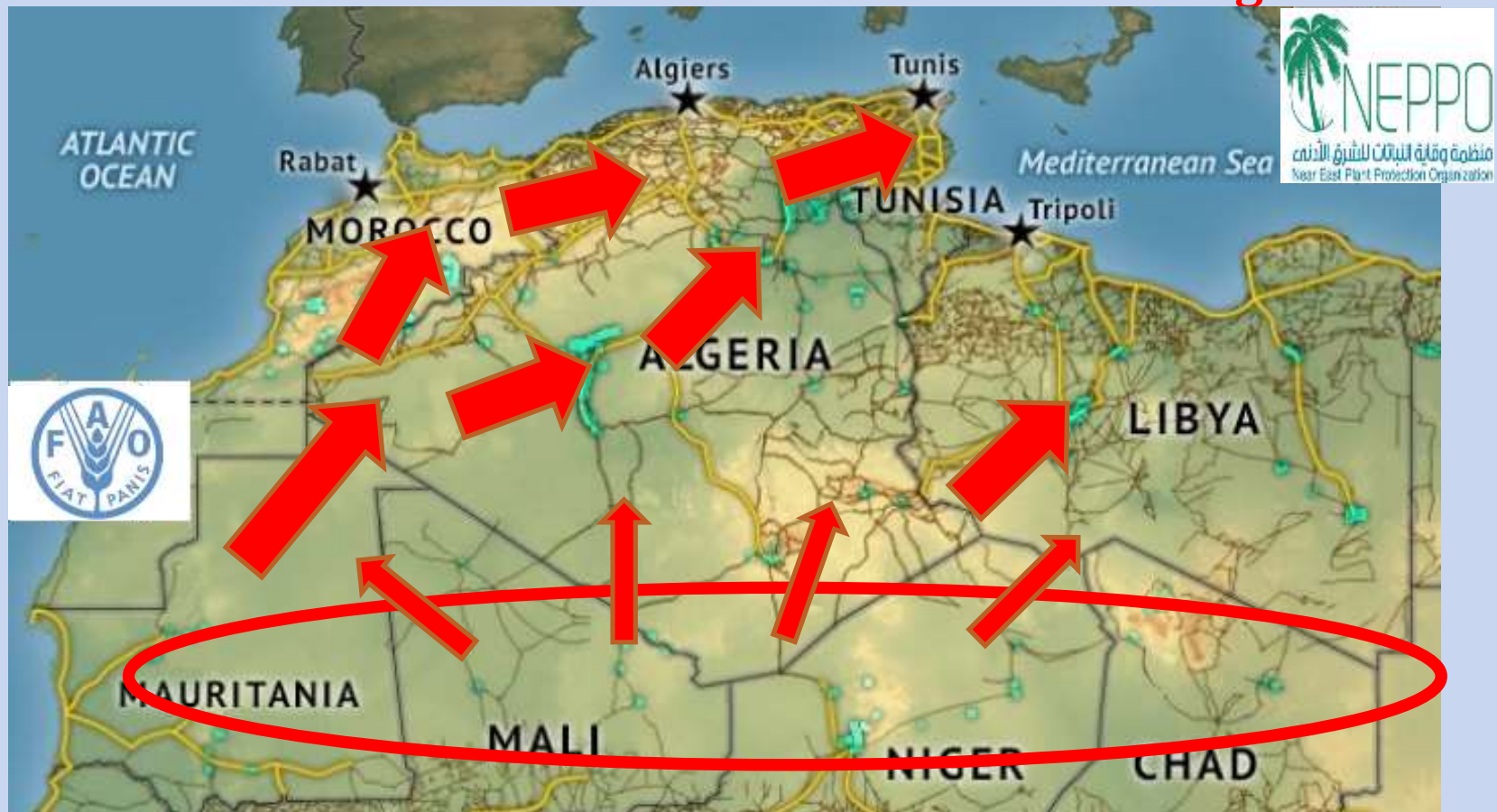
CRC: Commission for Controlling the Desert Locust in the Central Region

SWAC: Commission for Controlling the Desert Locust in South-West Asia

Desert Locust

(*Schistocerca gregaria*)

Invasions of 1988 & 2005 in the Western Region



Desert Locust

(*Schistocerca gregaria*)

(With the help of **FAO**)



Desert Locust

(Schistocerca gregaria)

Successful sustainable work of FAO



*** Every year (specially at autumn):**

- Preparation and maintenance of materials and facilities
- Detailed surveillance of spots forming swarms
- Quick chemical destruction of all forming swarms

*** In case of invasion:**

- Huge campaign to combat the invader pest

Red Palm Weevil

(Rhynchophorus ferrugineus)



Canary palms



Red Palm Weevil

(*Rhynchophorus ferrugineus*)



Date palms



Red Palm Weevil

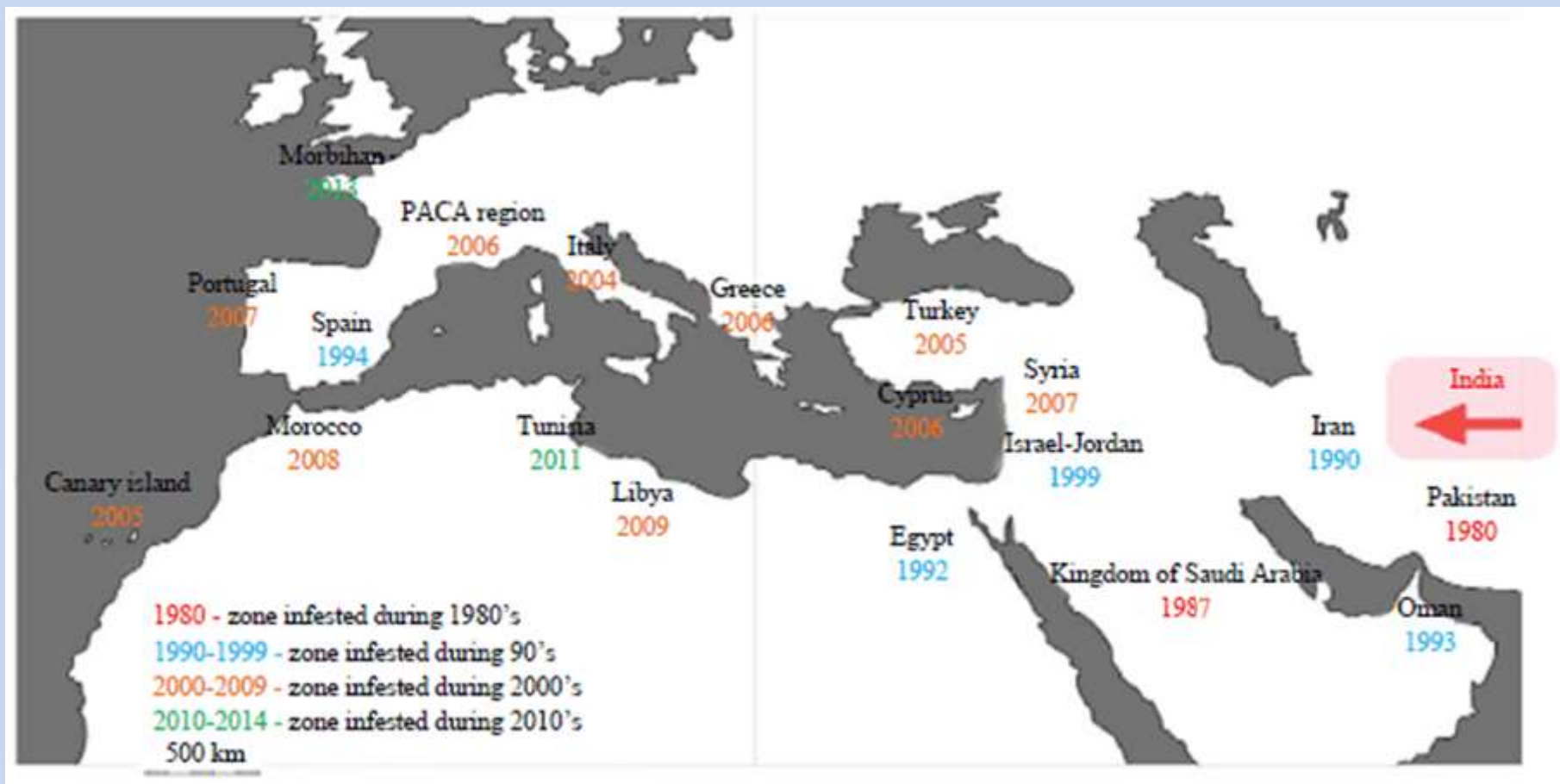
(*Rhynchophorus ferrugineus*)



Date palms

Red Palm Weevil

(*Rhynchophorus ferrugineus*)



Red Palm Weevil

(*Rhynchophorus ferrugineus*)

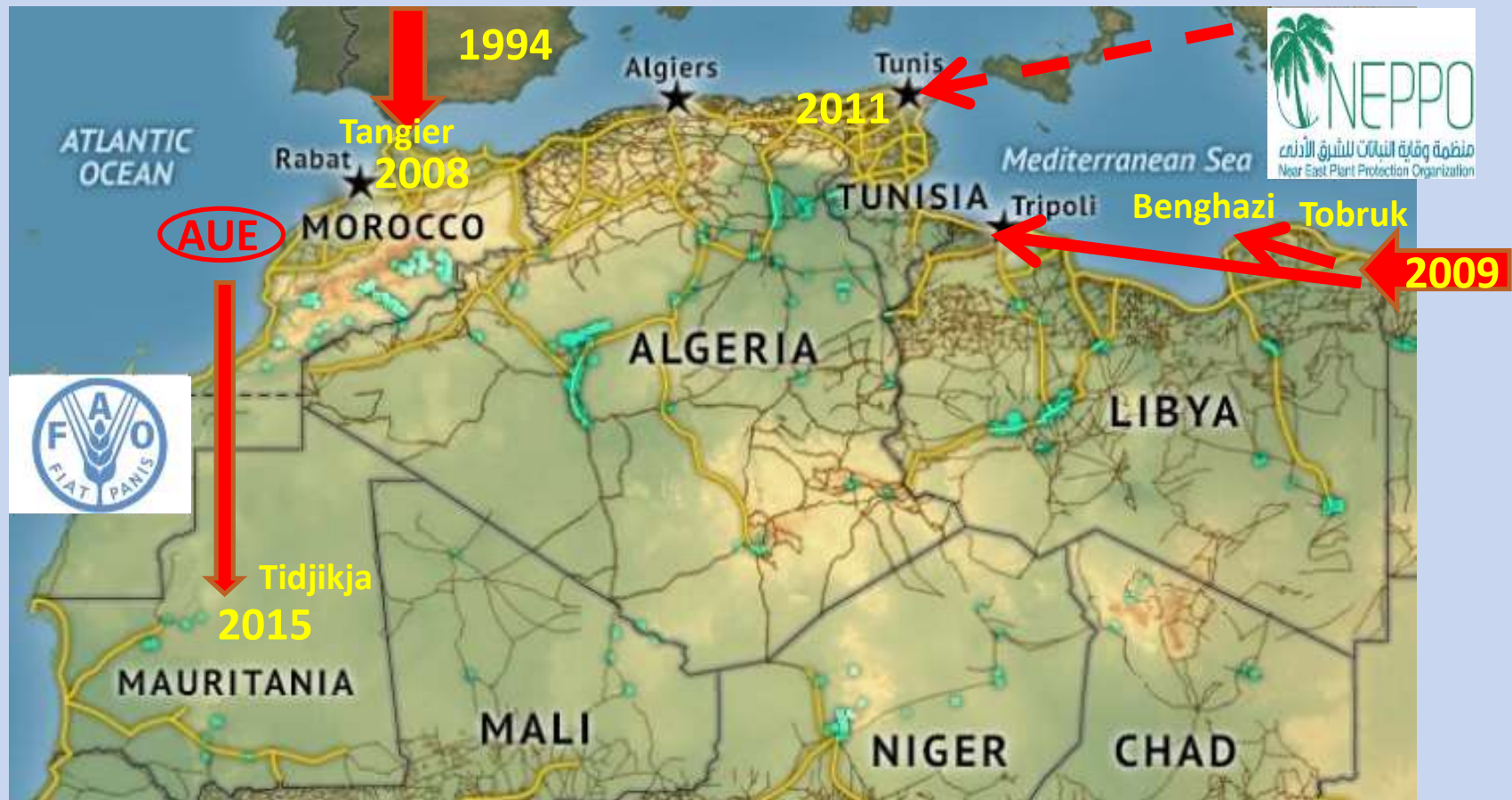
- Before 2008 -



Red Palm Weevil

(Rhynchophorus ferrugineus)

- First reports in the Maghreb countries -



Red Palm Weevil

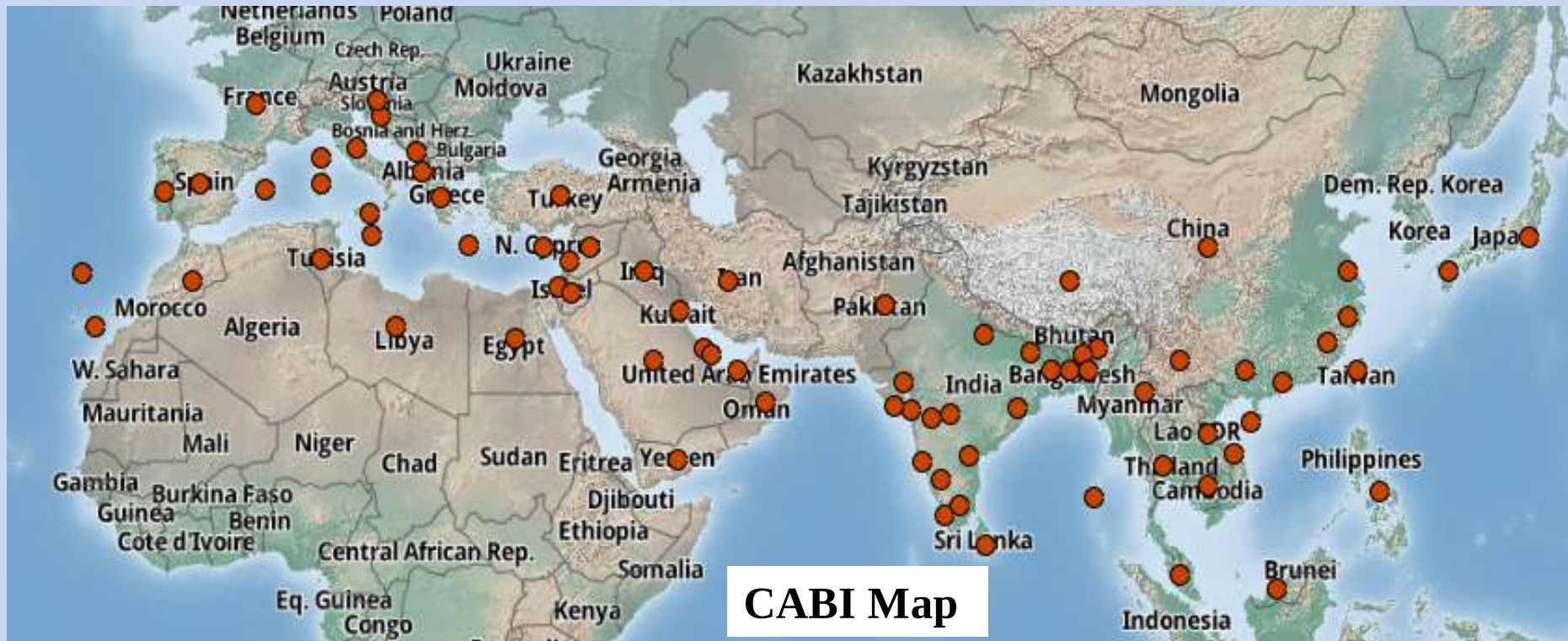
(*Rhynchophorus ferrugineus*)



Tunis / Number of infested and mostly cut palm trees : 30 (2011) → 2,700 (2016)

Red Palm Weevil

(Rhynchophorus ferrugineus)



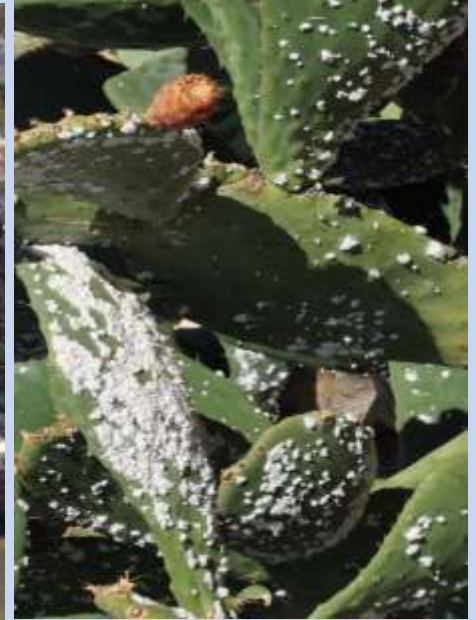
Cochineal of Cactus

(Dactylopius opuntiae)

Fruits



Cladodes



Cochineal of Cactus

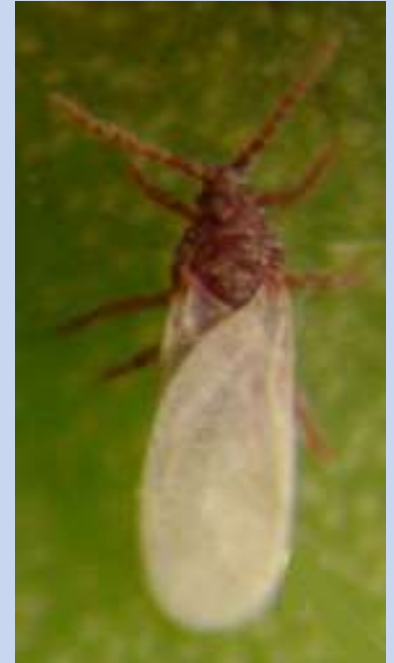
(Dactylopius opuntiae)



Adult Female



Larvae



Adult Male



Red Carmine

Cochineal of Cactus

(*Dactylopius opuntiae*)



D. coccus

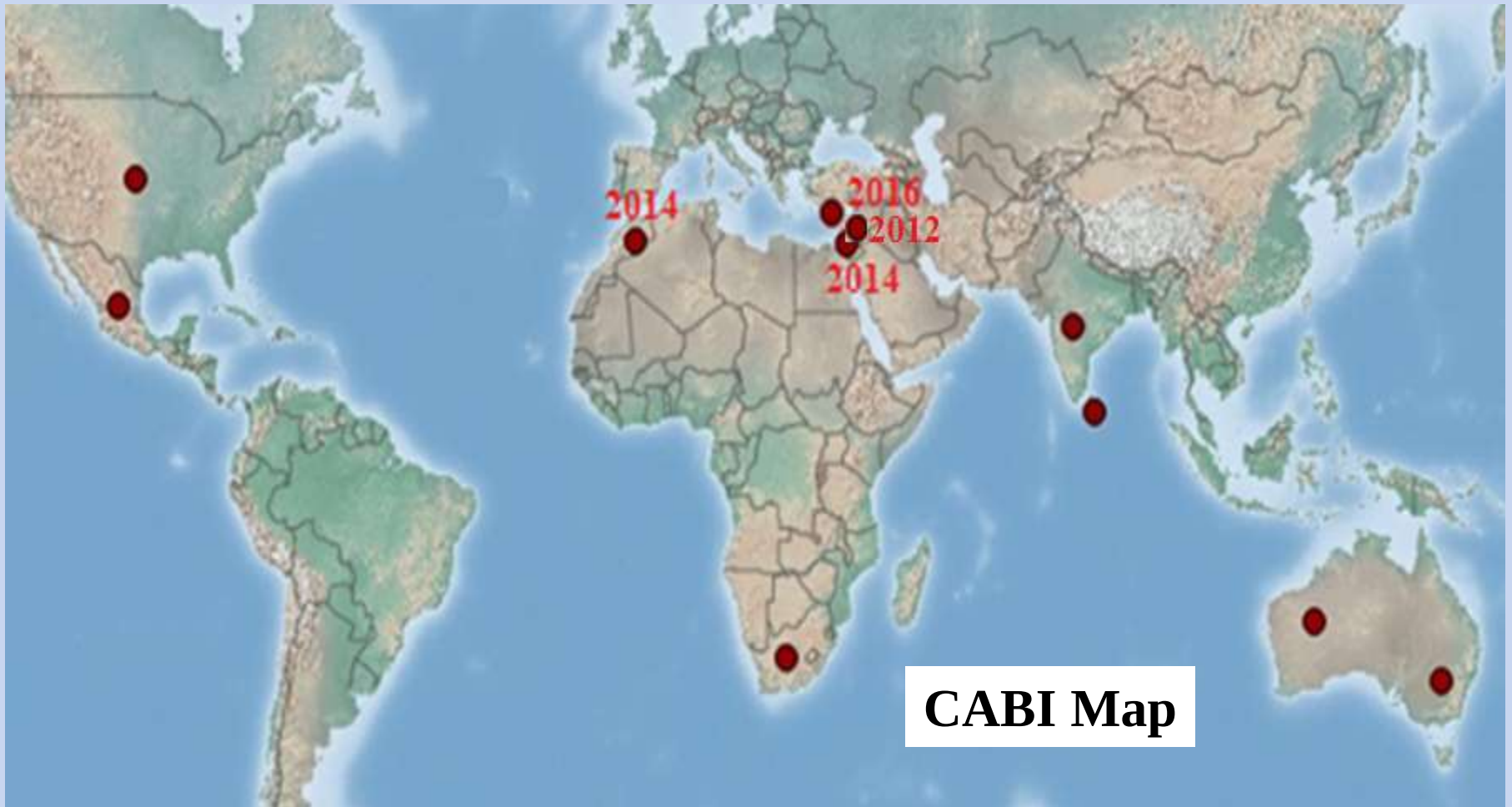
Do not confuse:

Dactylopius opuntiae: Insect pest of cactus, poor dye carmine producer and

Dactylopius coccus: Not insect pest, high dye carmine producer → reared on cactus and other substrates

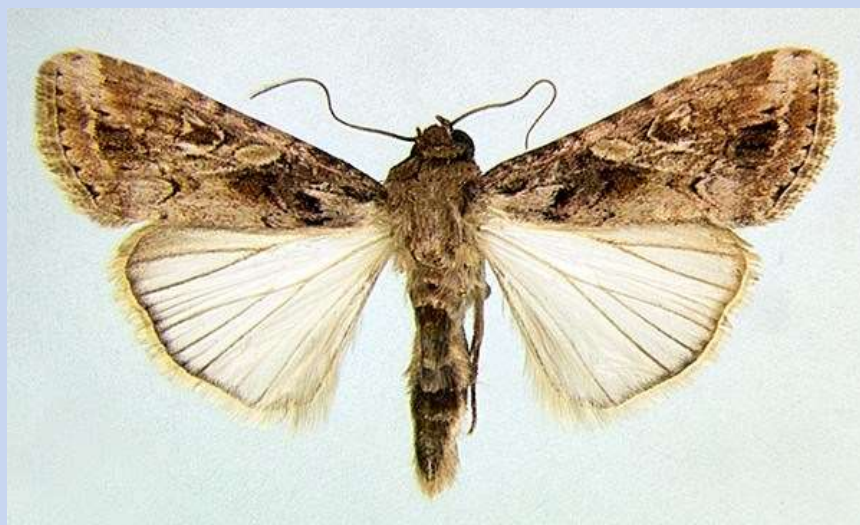
Cochineal of Cactus

(Dactylopius opuntiae)



African Armyworm

(*Spodoptera exempta*)



Why “Armyworm”: Because of their habit to ‘march’ in large numbers like soldiers,

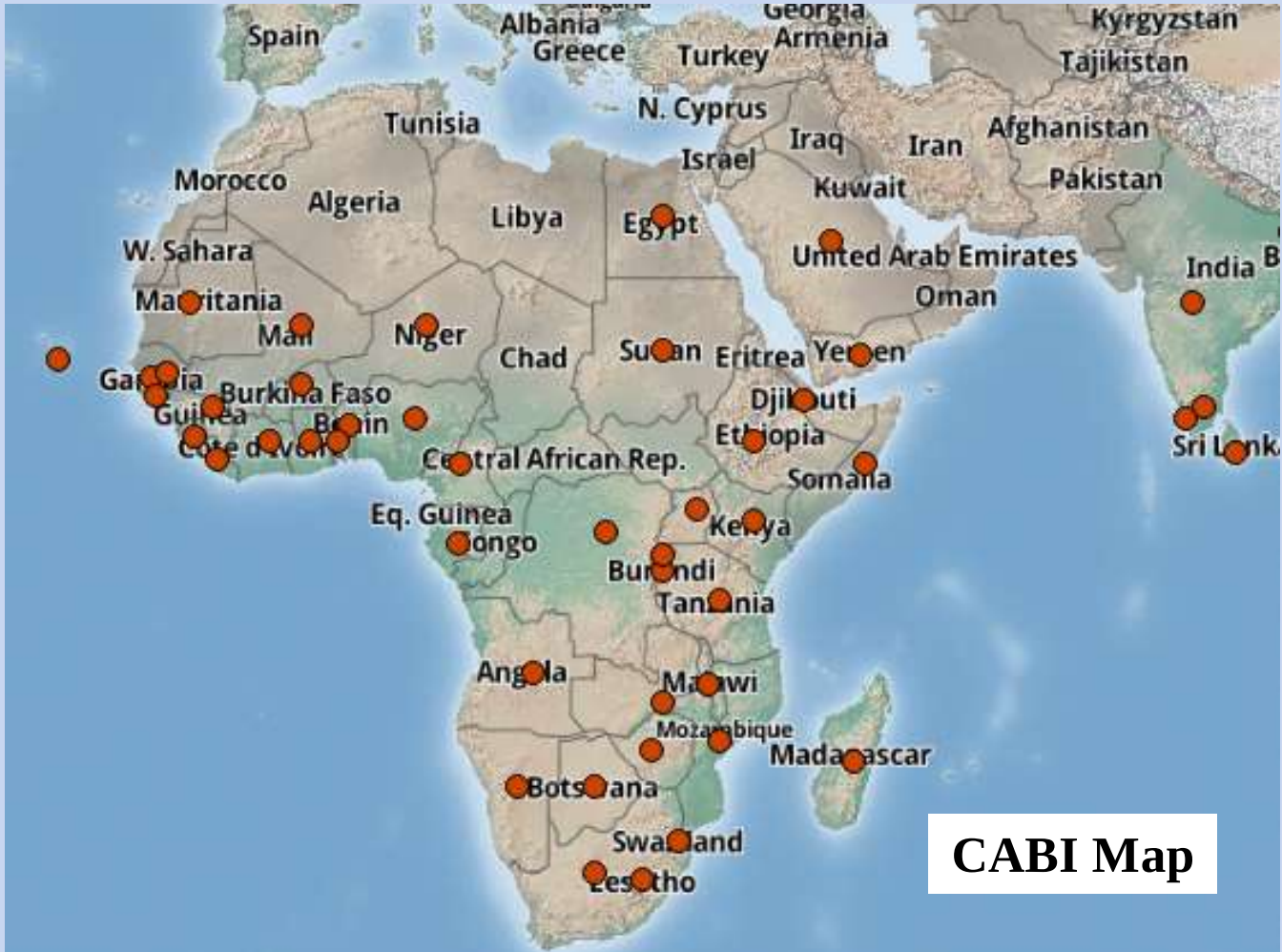
African Armyworm

(*Spodoptera exempta*)



African Armyworm

(Spodoptera exempta)



Fall Armyworm

(*Spodoptera frugiperda*)



- Fall Armyworm: in French “Légionnaire d’Automne”.
- More difficult to combat than African Armyworm, because less exposed.

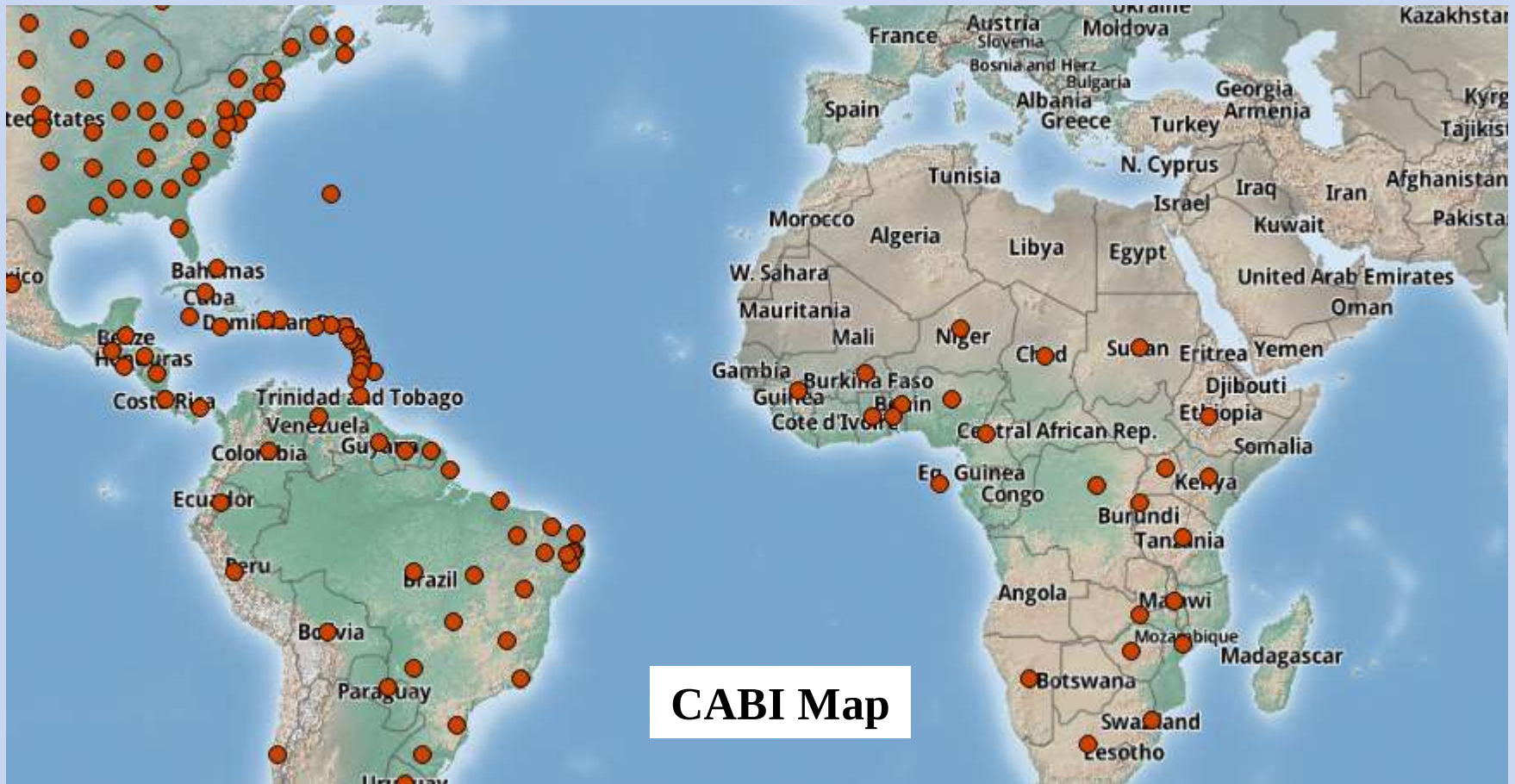
Fall Armyworm

(*Spodoptera frugiperda*)



Fall Armyworm

(*Spodoptera frugiperda*)



Peach Fruit Fly

(Bactrocera zonata)



Adult



Larvae on fruit



**Female laying
eggs**

Peach Fruit Fly

(*Bactrocera zonata*)



- Host spectrum: more than 50 host plants
- Main hosts: Peach, Mango, Guava, Apricot, Fig, Citrus,...

Peach Fruit Fly

(*Bactrocera zonata*)



Oriental Fruit Fly

(Bactrocera dorsalis)



Adult



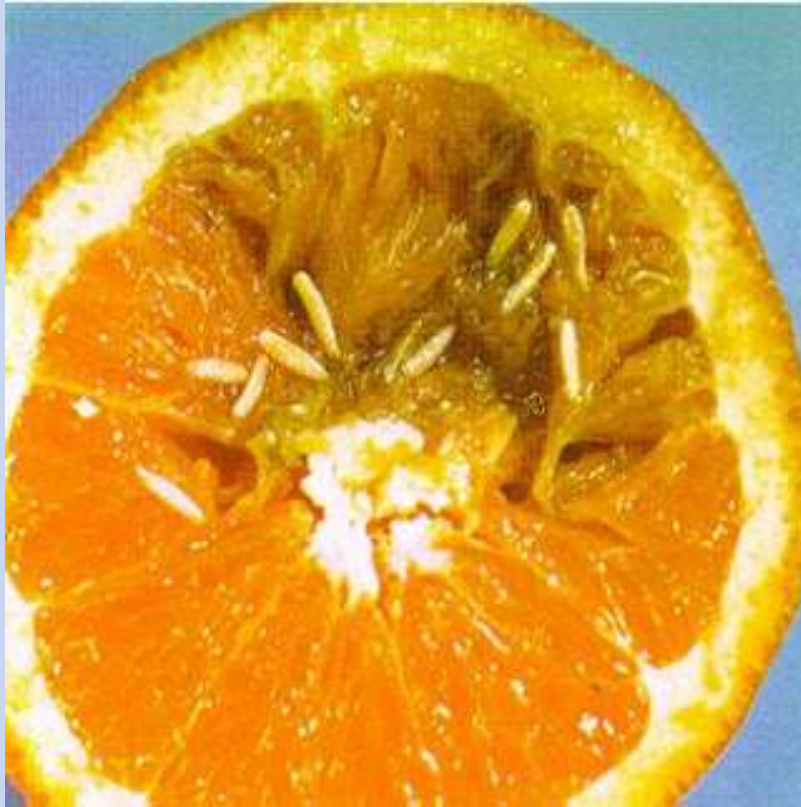
Larvae on fruit



**Female laying
eggs**

Oriental Fruit Fly

(*Bactrocera dorsalis*)



- Host spectrum: Around 480 kinds of fruit**
- Including: Apricot, Citrus, Fig, Peach, Pear, Tomato,...**
- More attacked: Avocado, Mango and Papaya**

Oriental Fruit Fly

(*Bactrocera dorsalis*)

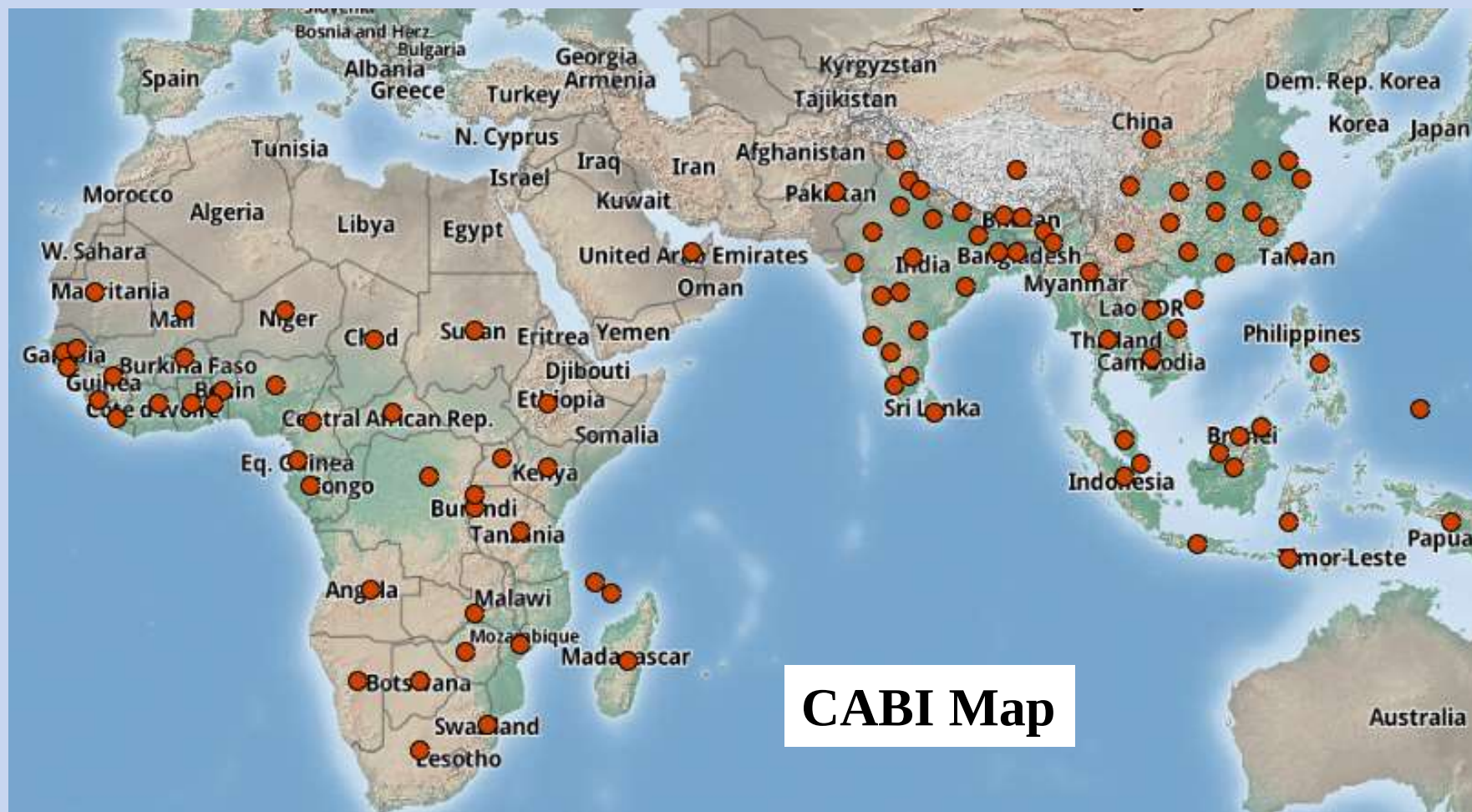
* It was established (2014) that *Bactrocera dorsalis* is the same species with:

- *Bactrocera invadens* (Asian fruit fly),
- *Bactrocera papayae* (Asian papaya fruit fly), and
- *Bactrocera philippinensis* (Philippine fruit fly)



Oriental Fruit Fly

(Current *Bactrocera dorsalis*)



NENA Countries:

Common Phytosanitary Problems

Invasive Weeds

Silverleaf Nightshade

(*Solanum elaeagnifolium*)



Silverleaf Nightshade

(Solanum elaeagnifolium)



- It is a perennial weed of the Solanaceae family,
- It originated from the western North America
- It is an invasive alien plant

Silverleaf Nightshade

(*Solanum elaeagnifolium*)



Whitetop Weed

(*Parthenium hysterophorus*)



Whitetop Weed

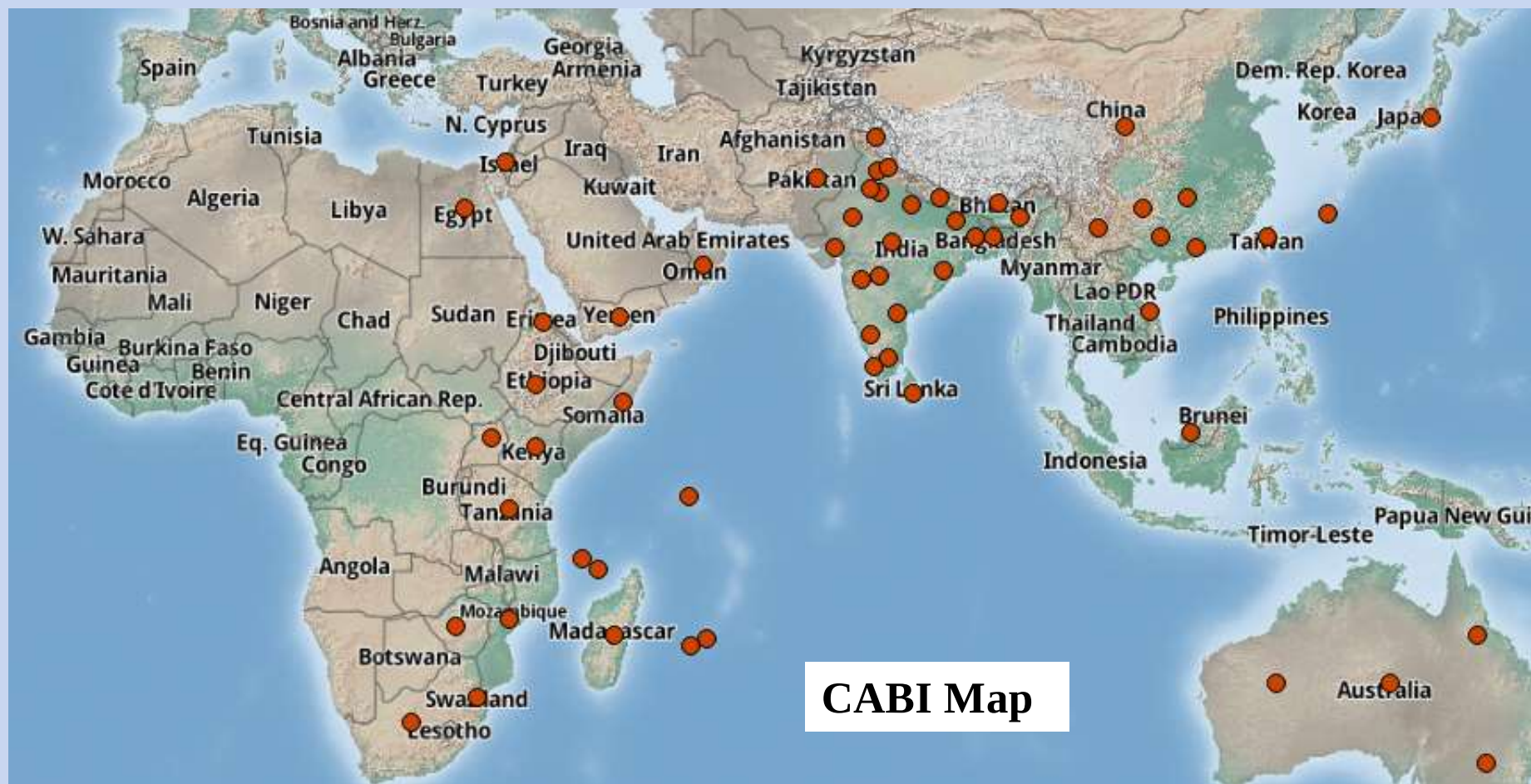
(*Parthenium hysterophorus*)



- It is an invasive plant of the Asteraceae family,
- It originated from American tropics
- It infests pastures and farmlands → disastrous loss of yields
- It produces allelopathic chemicals → suppress crop and pasture plants
- It is allergen → affect human and livestock
- It may resist to herbicides

Whitetop Weed

(Parthenium hysterophorus)





Thank You