Food and Agriculture Organization of the United Nations

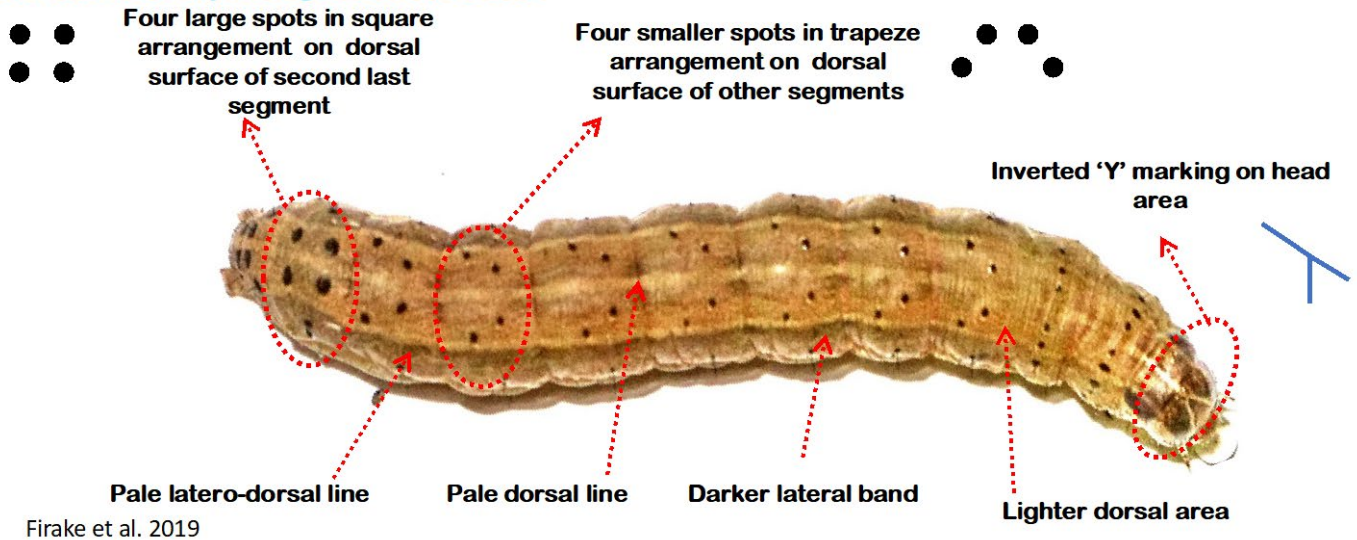
International Plant Protection Convention

Basic Biology & Current Distributions of FAW

Wee Tek TAY, CSIRO Australia

Spodoptera frugiperda Fall armyworm (FAW)

FAW larval morphological characters



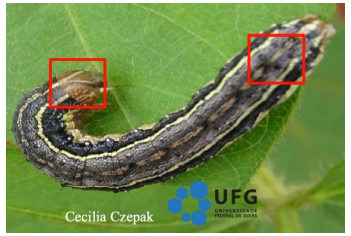
Firake et al. 2019
Fall armyworm: Diagnosis and Management (An Extension pocket book)
ICAR Research Complex for NEH Region, Umiam Meghalaya - 793103

TAXONOMIC Placement of FAW

Kingdom		Animalia
Phylum		Arthropoda
Class		Insecta
Order		Lepidoptera
	Family	Noctuidae
~1,089 genera	Genus	Spodoptera
~11,772 species	Species	frugiperda

- *Spodoptera* genus: 31 species

Different colour morphs



Africa, India, China). Genomic signatures confirmed that the invasive populations from China, India, Uganda, Tanzania, Malawi and Benin were likely hybrid po-

Karina C. A. Godinho, Vinicius Magalhães e Karin F.S. Collier, UFG/Brazil

Photo: C. Czepak, UFG

Due to the high mobility of the pest, resistance management must be implemented to cover entire regions and not just one agricultural unit

(extension and companies), and

causing damage and losses to 200 years in several countries in

Pasture grasses

Photo: C. Czepak, UFG

Photo: C. Czepak, UFG

Maize

Photo: Brent Wilson

Sugarcane

Photo: Chormule et al. www.6grain.com

Ginger

Firake & Behere (2020) J Crop Prot 137, 105233

Interception

Capsicum spp.

Cut flowers (*Rosa* sp.)

Photo: abc.net.au

Asparagus

Tomatoes

Photo: C. Czepak, UFG

Crop hosts

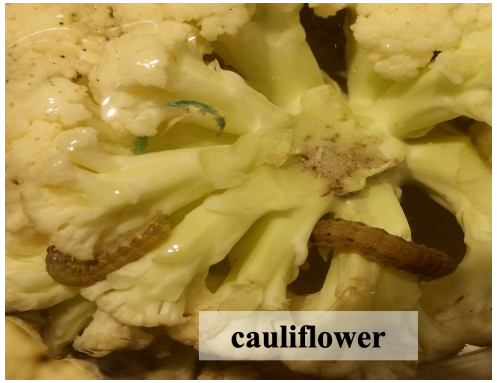
- Highly polyphagous

- Predominantly:
  - Maize
  - Sorghum
  - Sweet corn
  - Rice
  - Cotton
  - Grasses

- Invasive range:
  - Sugarcane
  - Ginger
  - Wheat

- Interceptions
  - Asparagus
  - Capsicum
  - Cut flowers (Roses, Chrysanthemum)

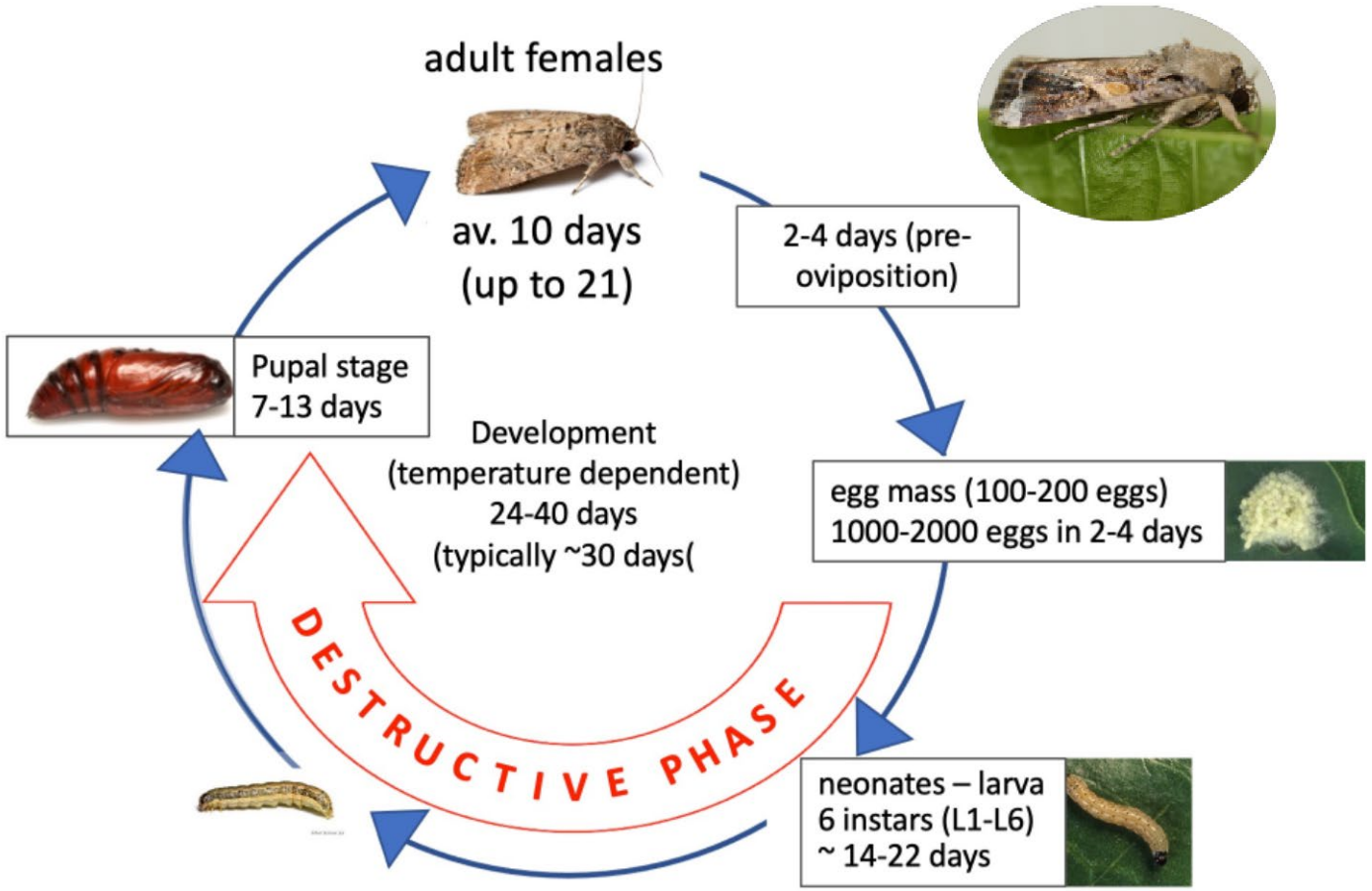
Reported from >350 plant hosts, however ability to complete development on all reported plant hosts unknown.



Attack on various crop hosts in native range (Goias, Brazil)

Photos: C. Czepak, UFG

Life Stages

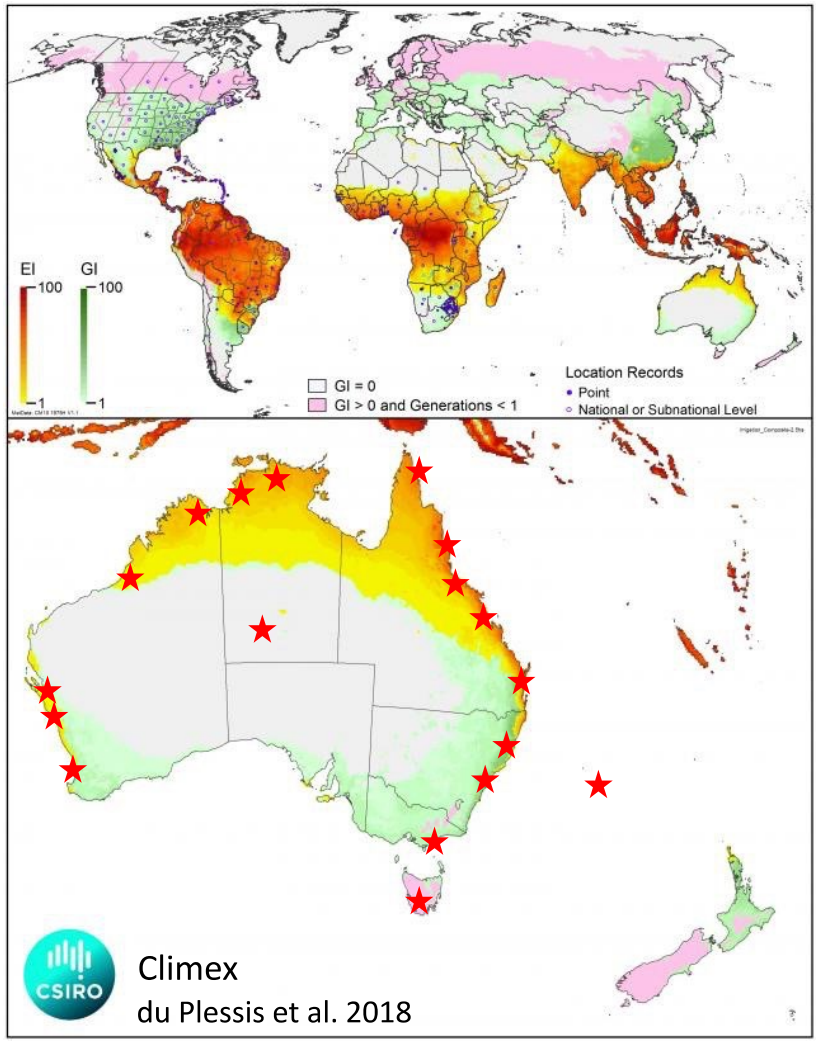


Life stages and relevance to invasive range

- most ecological data unknown

- Life cycle in new invasive ranges needed
  - Tropical regions
  - Cropping landscape consideration
    - crop types
  - Movements between countries

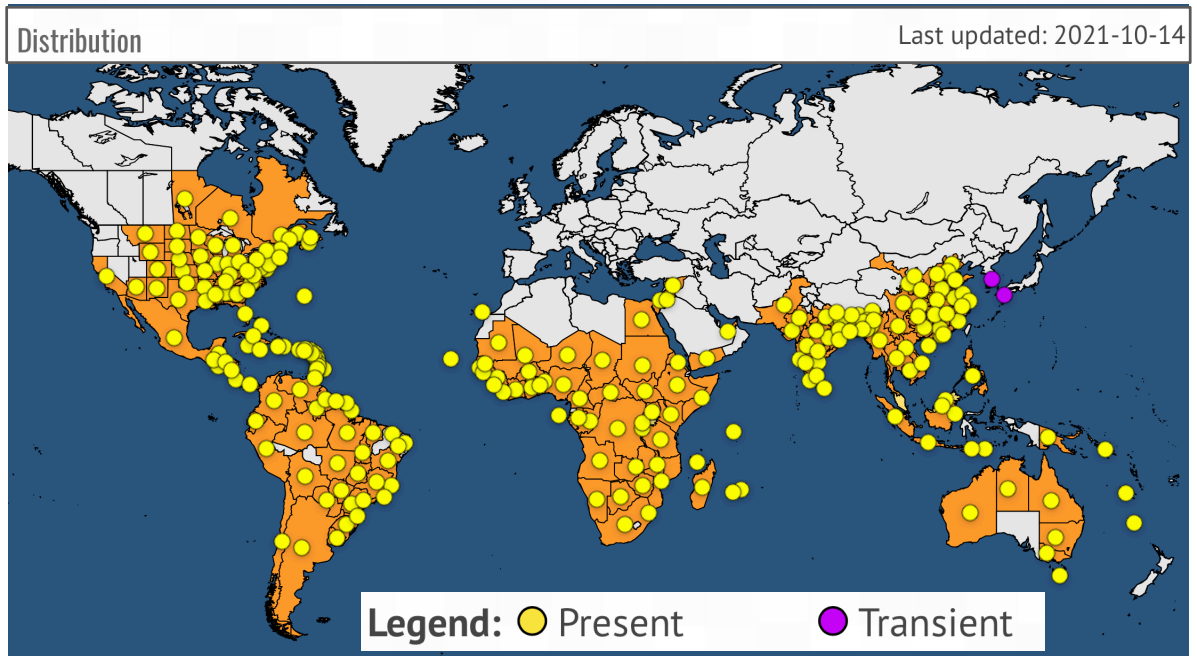
Potential Distribution



- **Long distance flight ability**
- **Movements via human activities**
- **Rapid detection (>70 countries)**

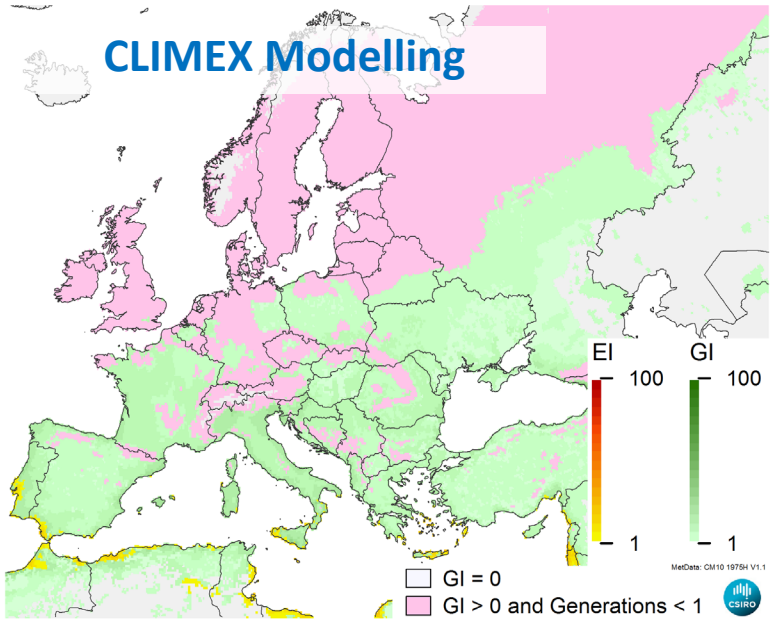
EPPO Global Database

Spodoptera frugiperda (LAPHFR)



Potential FAW distribution in the EU

CLIMEX Modelling

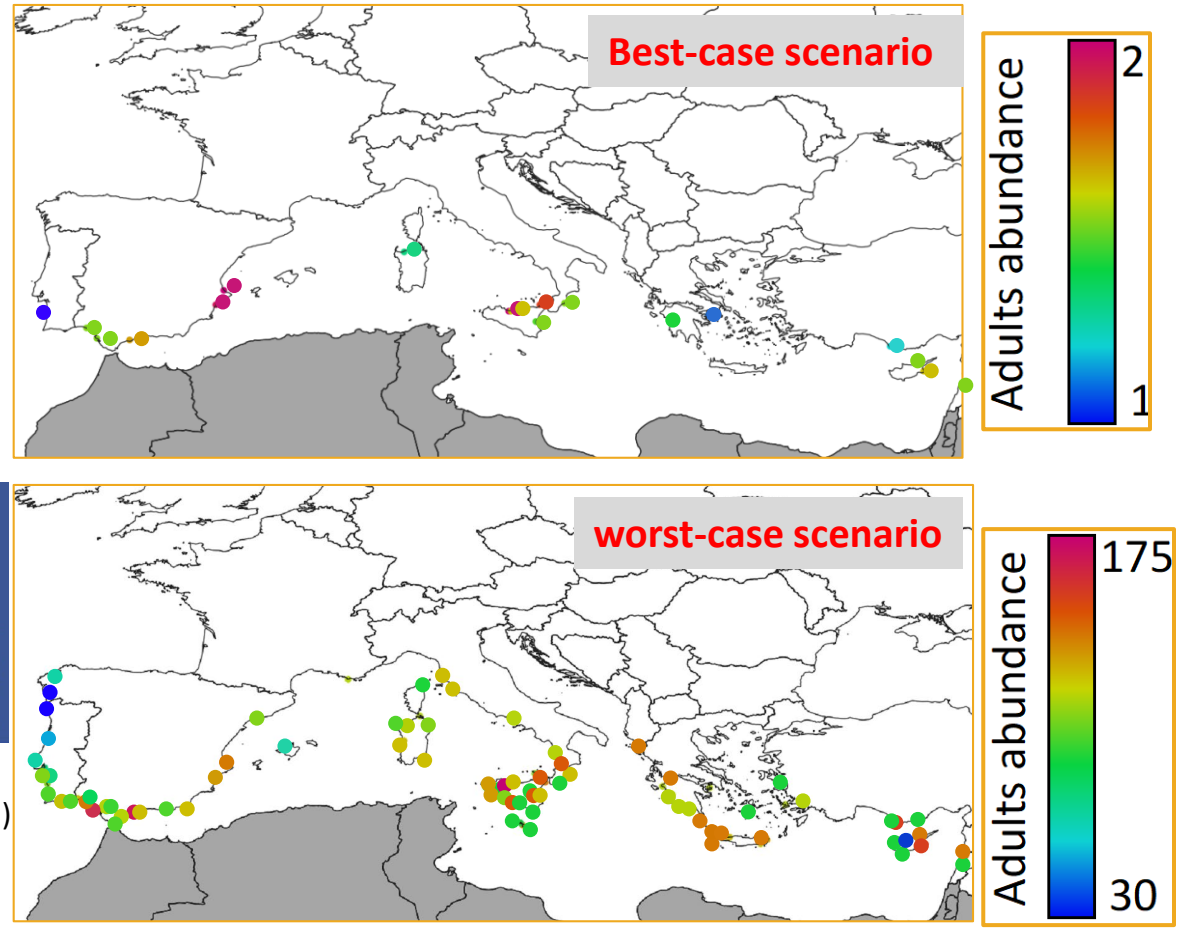


EI: Ecoclimatic Index – potential suitability for persistence

GI: Growth Index – suitability for population growth

- **Southern EU is most at risk with marginal climate suitability for establishment of FAW**
- **Supporting what du Plessis et al. (2018) found using CLIMEX modelling**

Non-linear model for stage-structured population dynamics

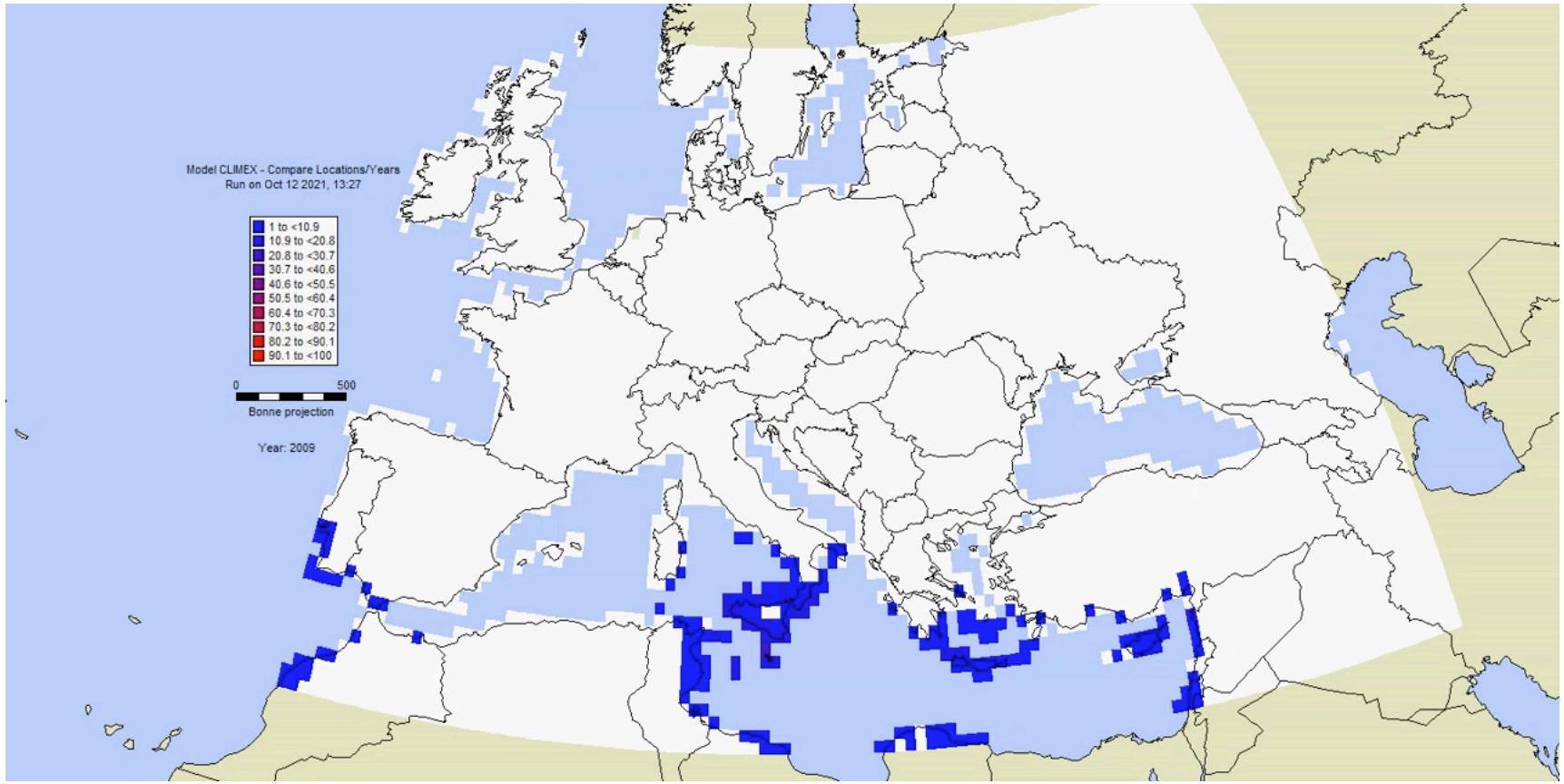


UNIVERSITÀ DEGLI STUDI DI BRESCIA

Gilioli et al. (2021, unpubl.)

Interannual variation in ecoclimatic index (EI) for FAW potential establishment in the EU

Darren Kriticos, CSIRO (unpublished)



- Blue areas: marginal climate suitability for persistence

(0 unsuitable, 100 perfect conditions year-round)

- Modelled on du Plessis et al. (2008).
- Ran on time-series data (10 years).
- Europe is either too cold, or too dry (Mediterranean summer)

Introduction Pathways: Current hypothesis

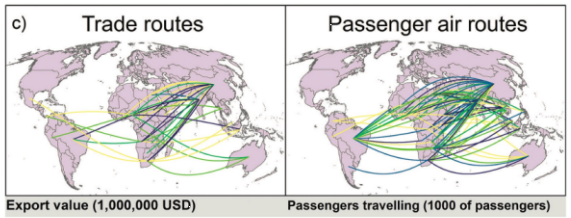
- Agricultural commodities export/tourists: US (FL) to West Africa
- Once in Africa, natural spread/commodity movements/human-assisted

Africa to Middle East; India; SEA (Myanmar); China; Taiwan, South Korea; Japan (Far East)
Thailand/Cambodia/Laos, Vietnam, Philippines

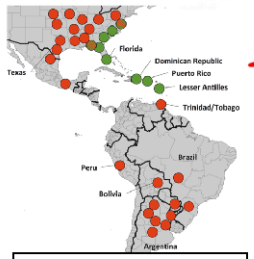
F A W

Early et al. (2018)

- UN data (total exports) from sub-Saharan African countries to all countries between 2012-2016.
- total trade volume >USD$ 500 M as most likely to introduce FAW
- Passenger (air) also considered

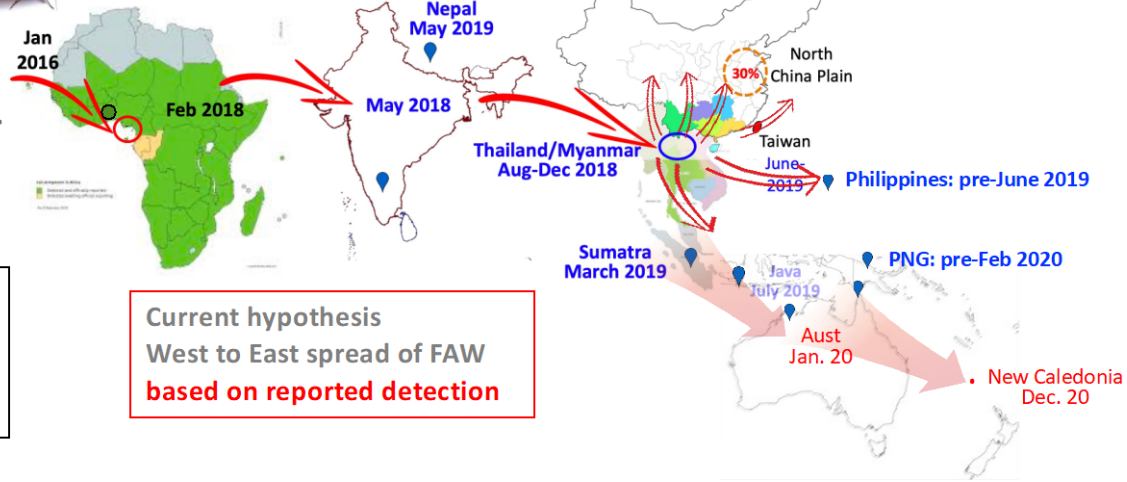


2 SNPs on COI
1 SNP on Tpi

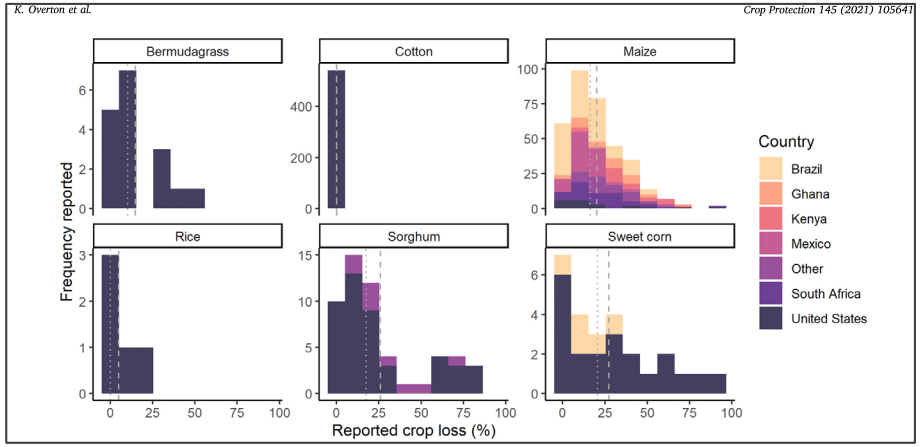


Origin of Togo FAW:
Eastern USA & the Greater Antilles

Nagoshi et al. 2017
(PLoS ONE 12, e0181982)

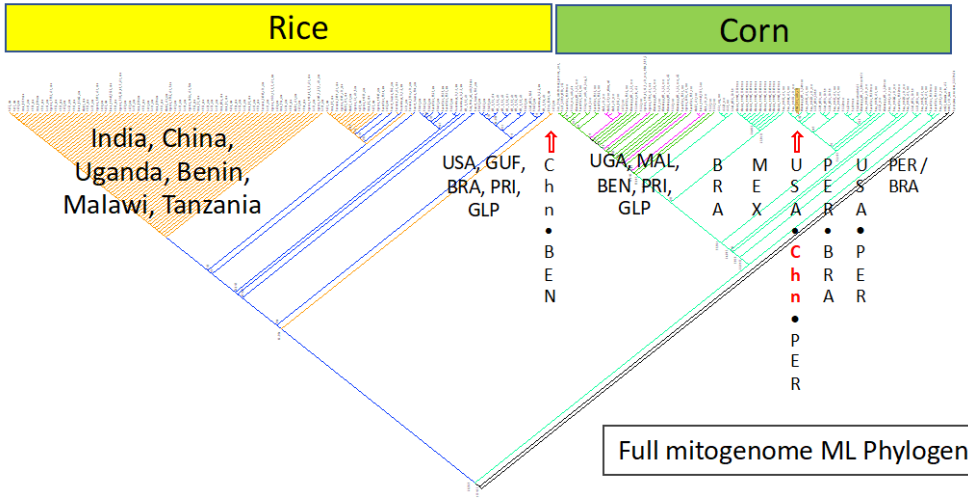


Current hypothesis
West to East spread of FAW
based on reported detection



- Two genetically distinct forms across native & invasive ranges

Invasive populations: predominantly 'hybrids' status from nuclear markers



Full mitogenome ML Phylogeny

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Thank you

IPPC Secretariat

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of the United Nations (FAO)

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