Update: Classical Biological of Diamondback Moth (*Plutella xylostella*)


Credit: Russ Ottens, University of Georgia, Bugwood.org

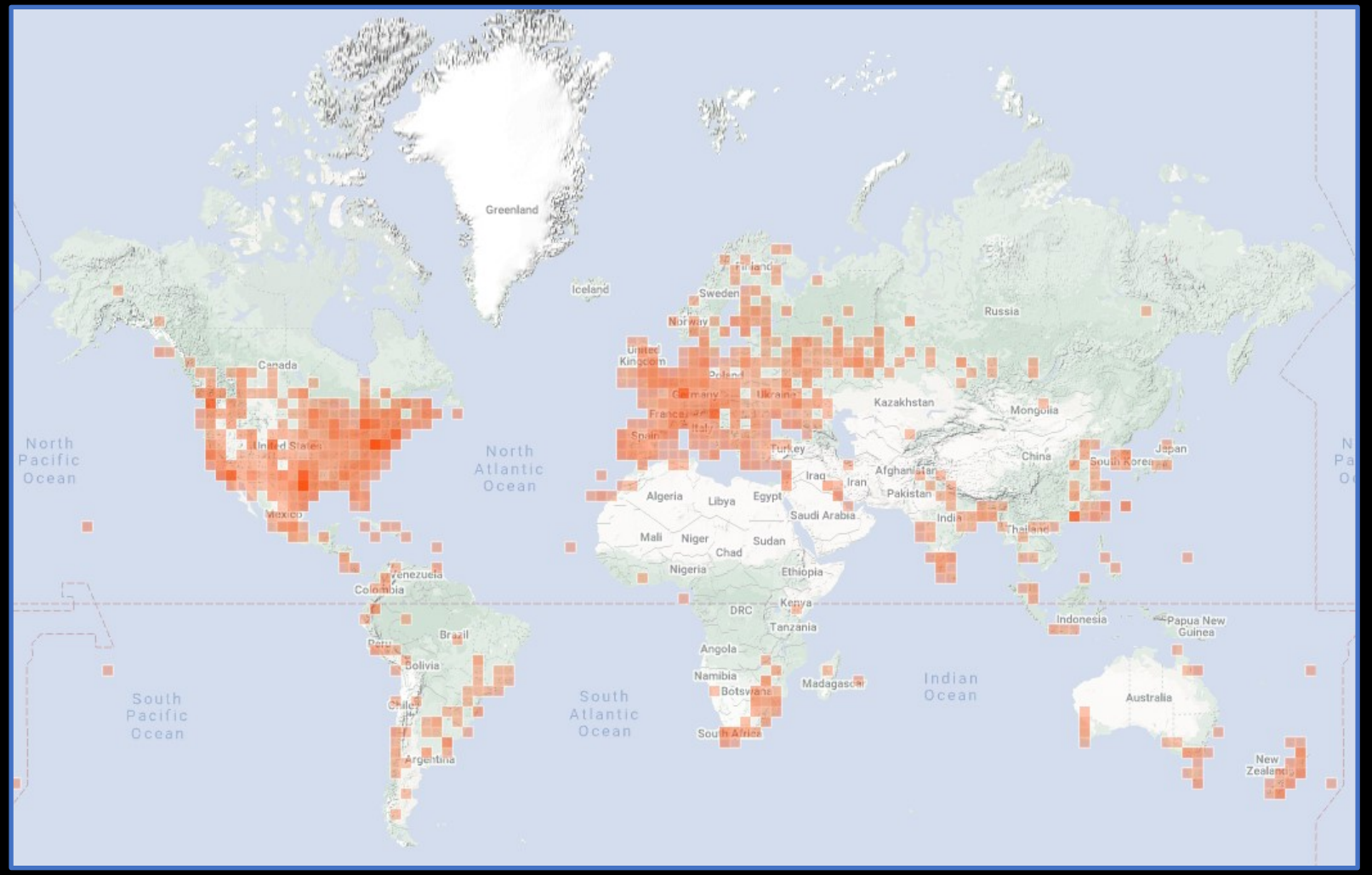

Credit: Ian Grettenberger, UCD


Credit: Ian Grettenberger, UCD

Ricky Lara, Ph.D.
Senior Environmental Scientist, Specialist
CDFA Biological Control Program
December 13, 2022

Brief DBM History

- Not native to US. 1854, Illinois 1st detection.
- Believed to originate from Mediterranean region or South Africa.
- Worldwide pest of crucifer crops, e.g., cabbage, broccoli, cauliflower
- $4-5 billion/yr in global management costs.
- Multivoltine



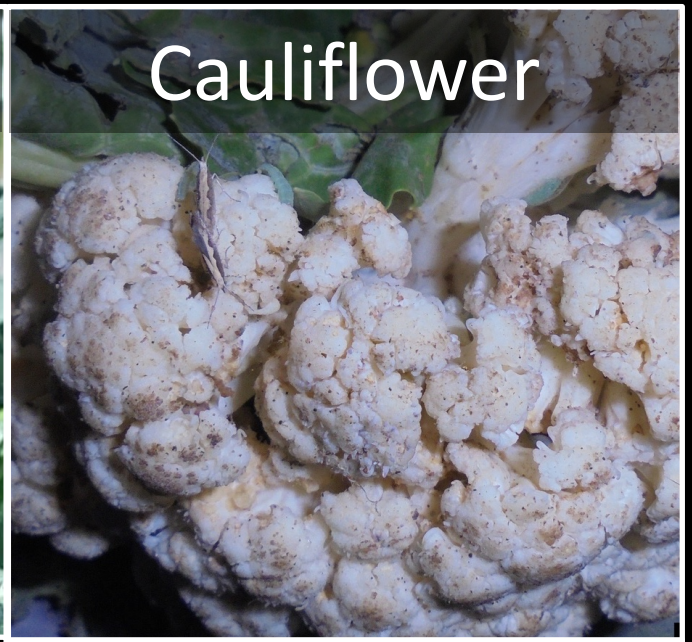
DBM Life Stages

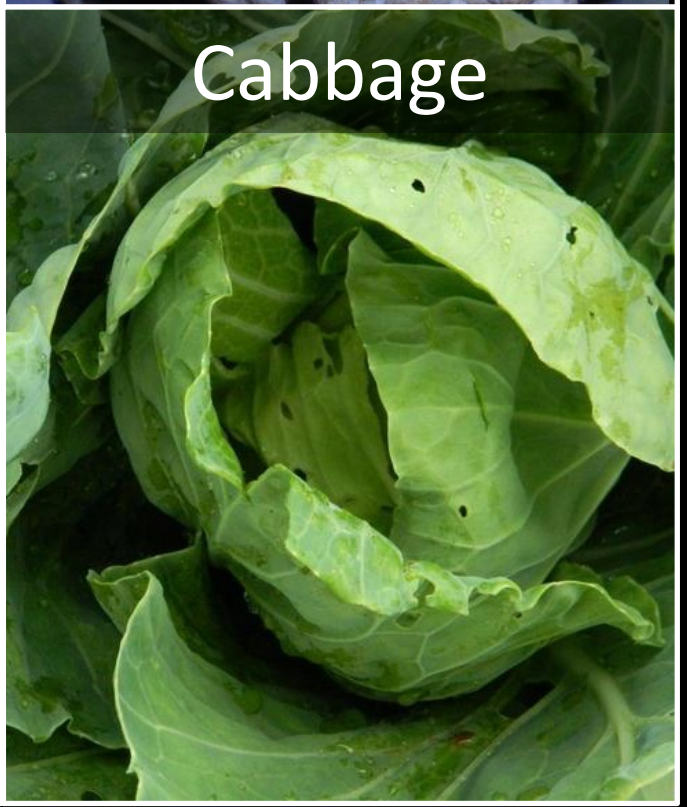
- Egg-Adult development 17-51 days (env. factors)
- Adults 0.3-0.4 in length, longevity ~2 weeks. Weak fliers but aided by wind dispersal
- ~150 yellow-white eggs, singly or groups generally on upper leaf surfaces, along veins
- 4 larval instars that cause direct feeding damage. Will also wriggle when disturbed
- Pupation in silk cocoon

Feeding Damage

California Cole Crop Production

- 800+ Farms: 150,000+ acres
- #19 Broccoli, $612 million: Monterey, Santa Barbara, Imperial
- #24 Cauliflower, $401 million: MY, SB, IM
- #46 Cabbage, $128 million: MY, Ventura, SB





Improve DBM IPM in California

Ian Grettenber, UCD

Diego Nieto, Driscoll's

Daniel Hasegawa, USDA-ARS

Paul Rugman-Jones, UCR

Oleg Daugovish, Ventura UCCE

Maripaula Valdes-Berriz, Ventura UCCE

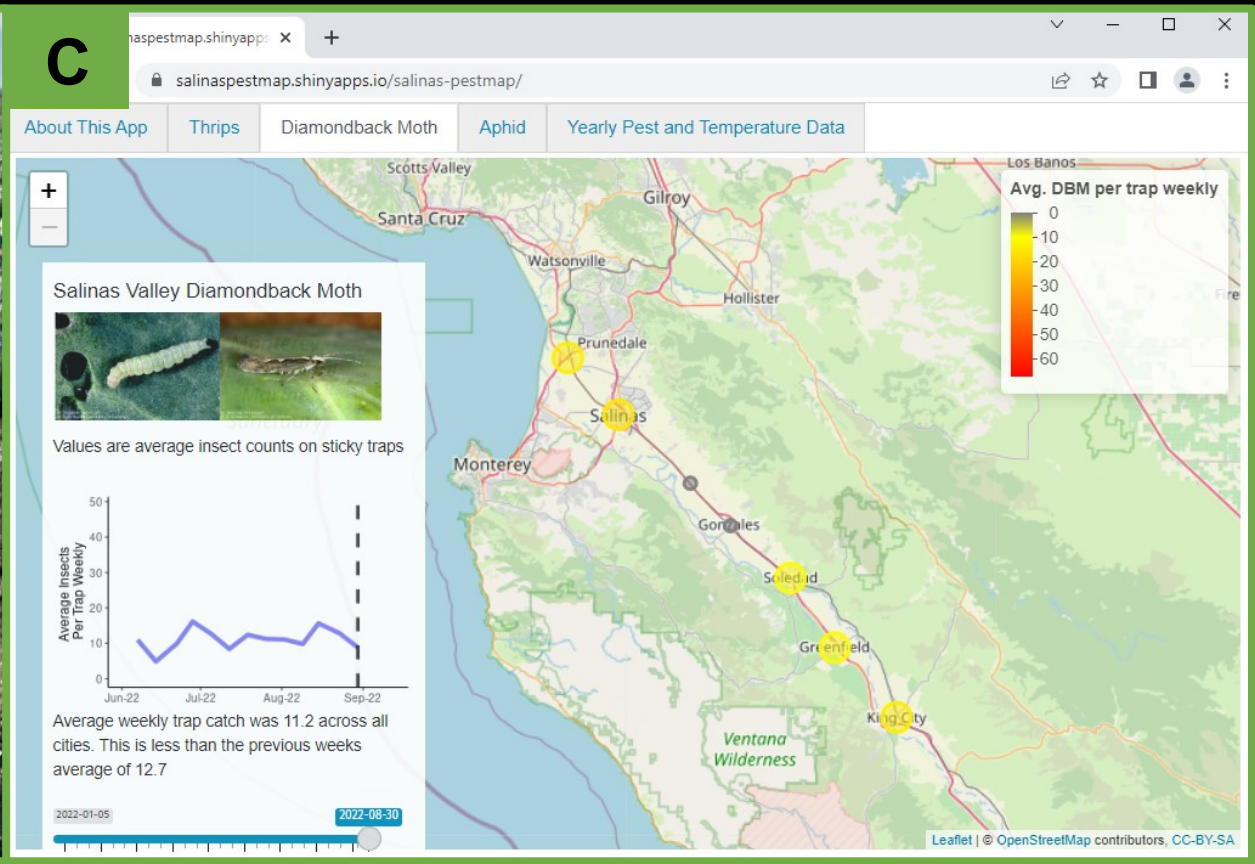
Ricky Lara, CDFA

Monitoring

A

B

C

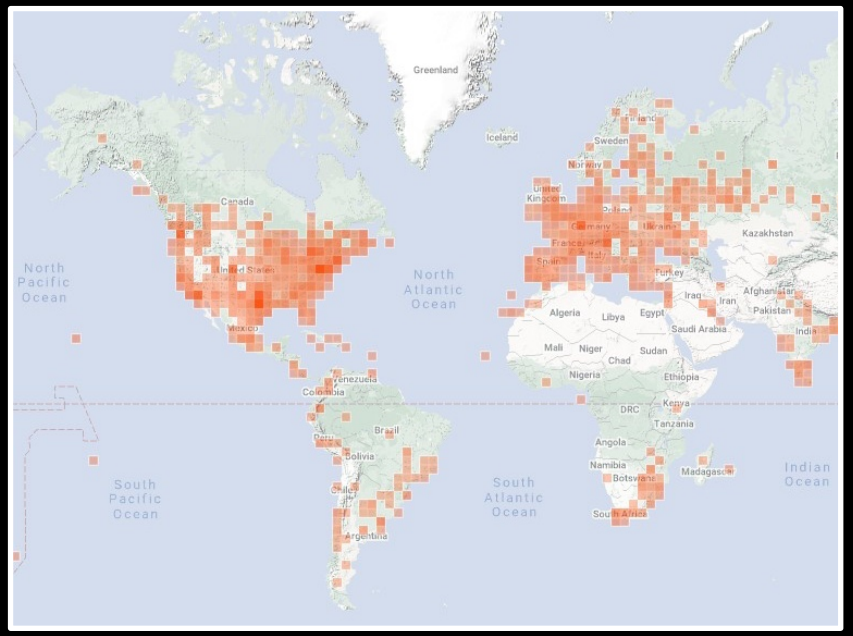


Establishing a pheromone-based trapping network in the Salinas Valley for the benefit of growers to view current pest trends. Work led by Daniel Hasegawa (USDA), Ben Lee (UCD), Ian Grettenberger (UCD).

Starting Classical Biological Control

Going to the field!

Sampling DBM
to determine origin of invasive populations based on DNA signature



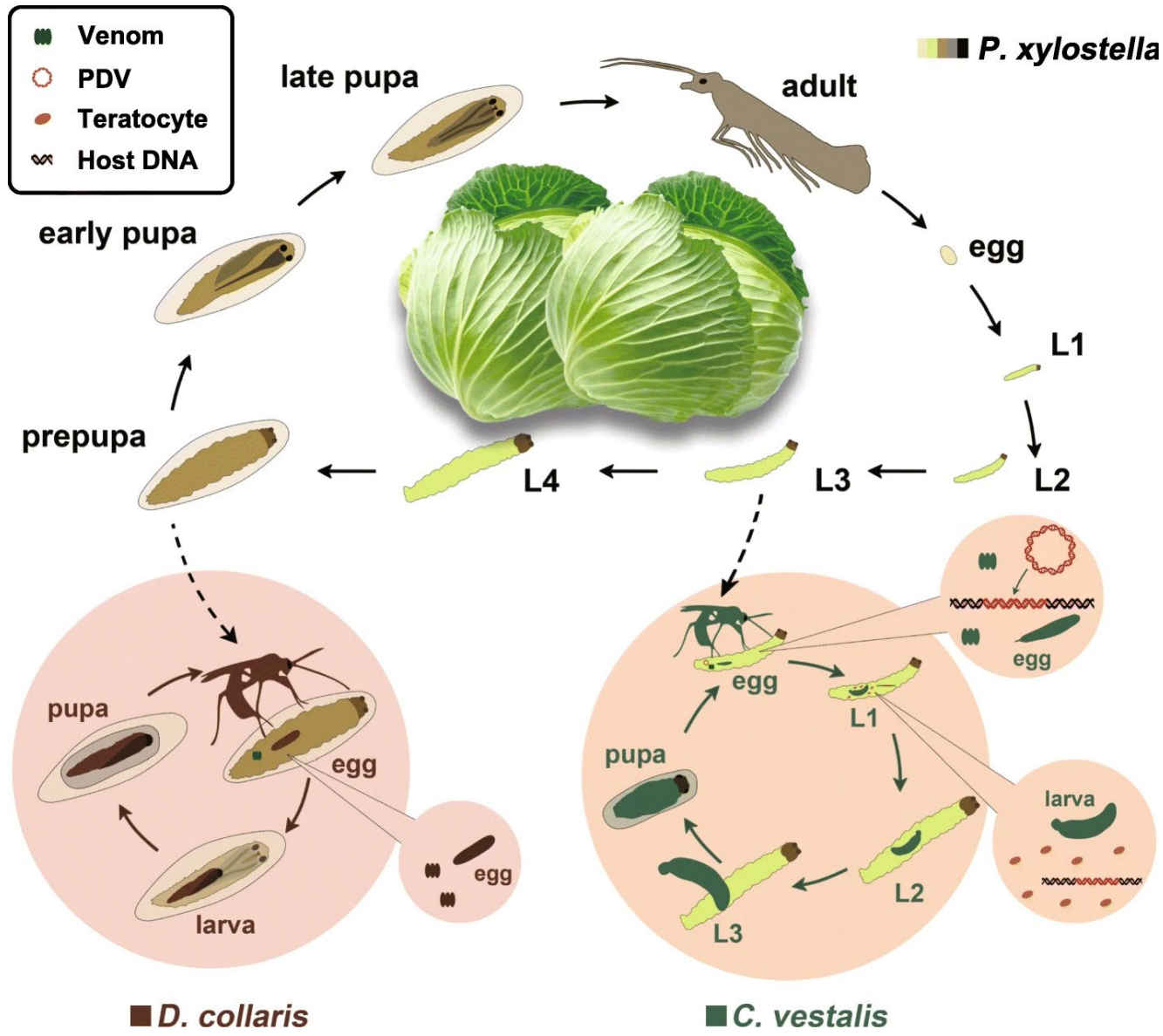
Collection of Natural Enemies from regions that are climate-adapted to CA

EBCL DBM Team

- Javid Kashefi: Foreign exploration
- Marie Claude Bon: Parasitoid DNA work
- Gaylord Desurmont: Establish, rear parasitoids and conduct quarantine studies

Types of DBM Parasitoids Agents

- 150+ of hymenopteran parasitoids recorded in the world.
- Egg: Trichogramma parasitoids. Not entirely host specific to just DBM. Inundative biological control.
- Larval parasitoid: *Diadegma semiclausum*
- Pupal parasitoid: *Diadromus collaris*

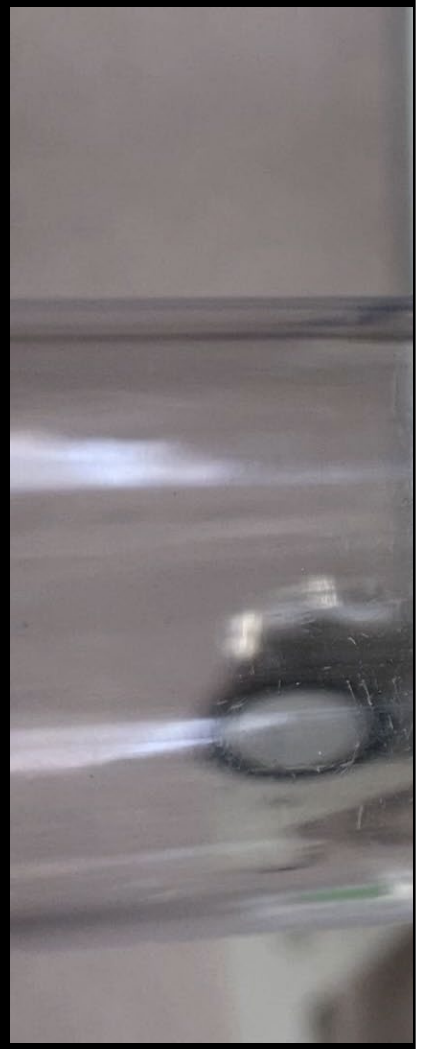


The life history of *C. vestalis* and *D. collaris*. *C. vestalis* preferentially parasitizes second and third instar *P. xylostella* larvae (L2 and L3); and *D. collaris* parasitizes pupal stage hosts. Shi et al. 2019.

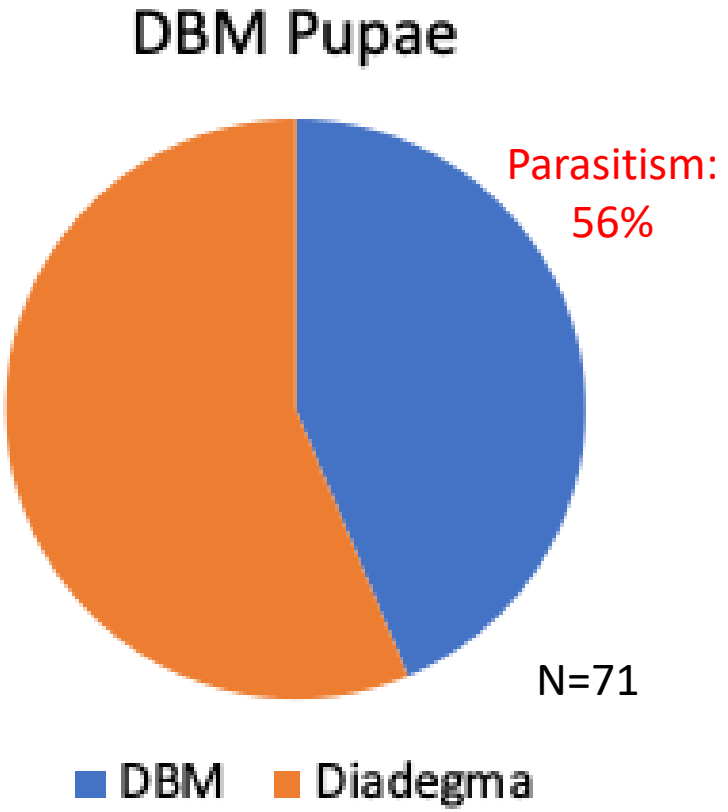
Cotesia sp. parasitizing DBM larvae

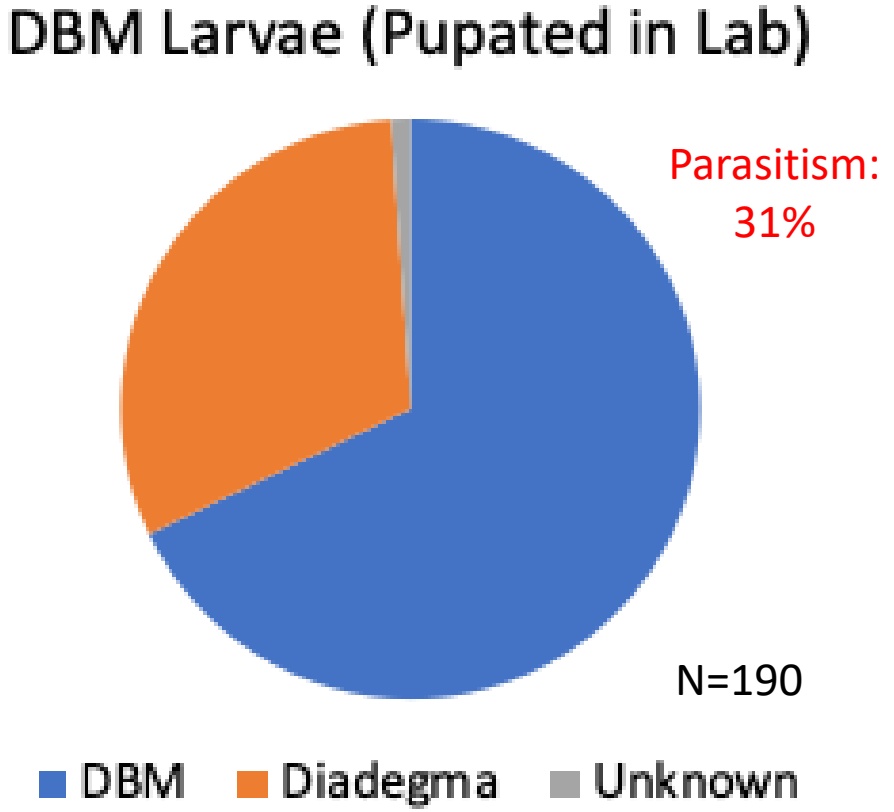
J. Holopainen

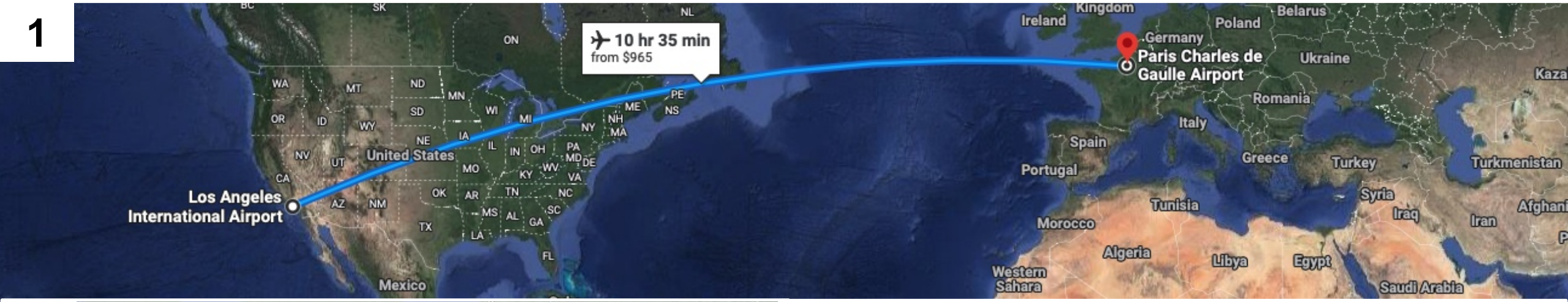
Diadegm ng DBM

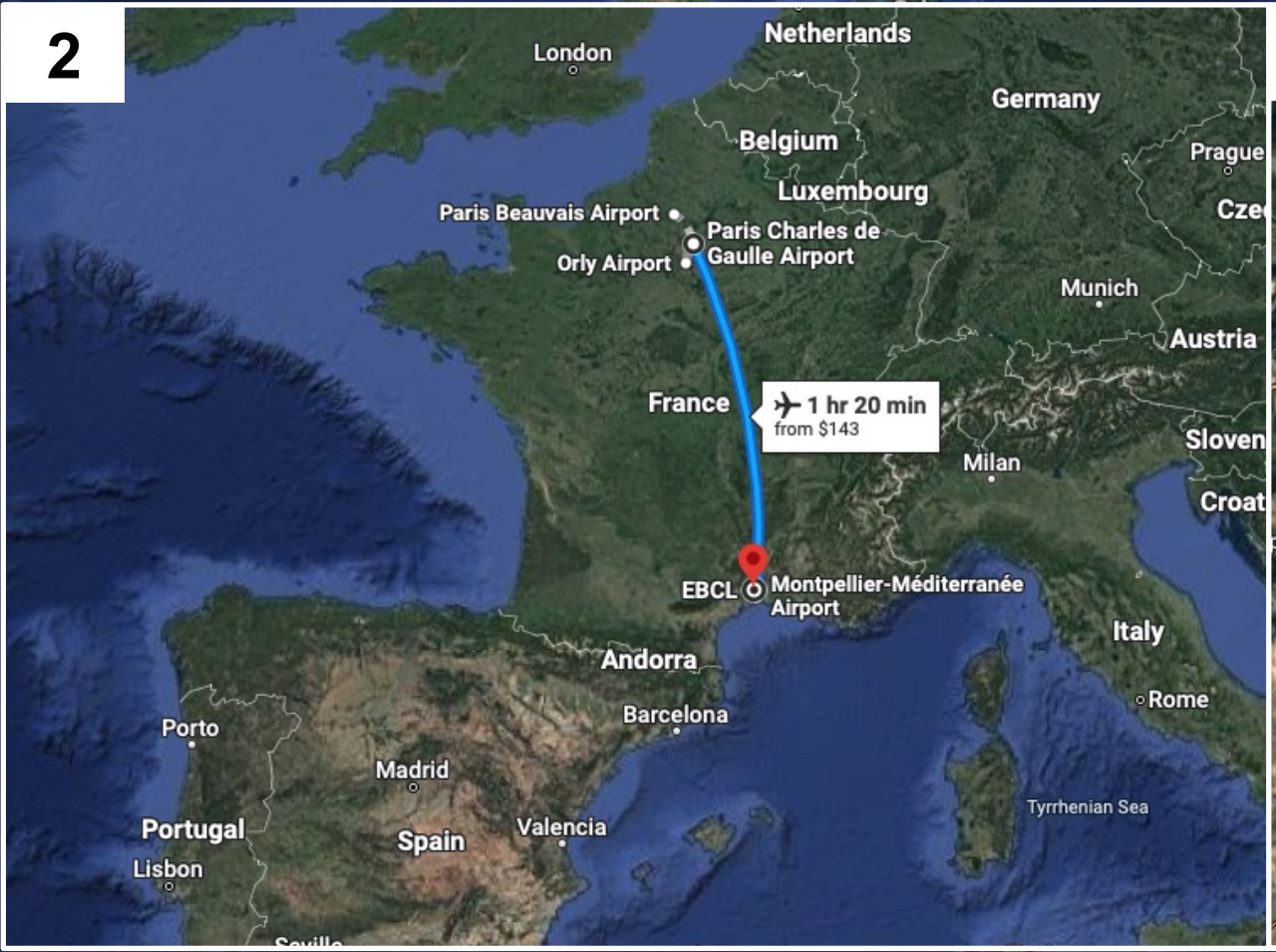


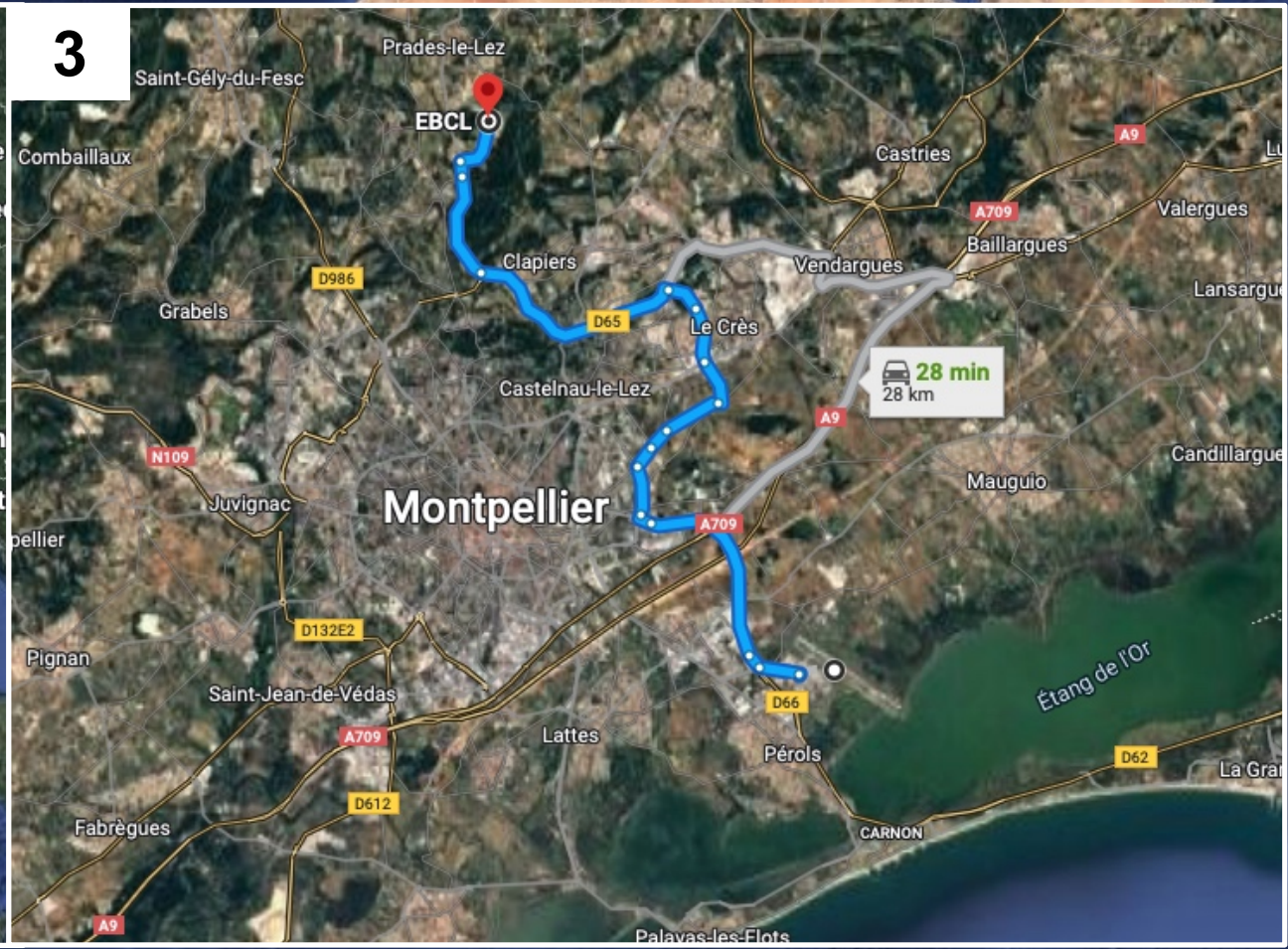
Snapshot of DBM Sampling (Oct 23)

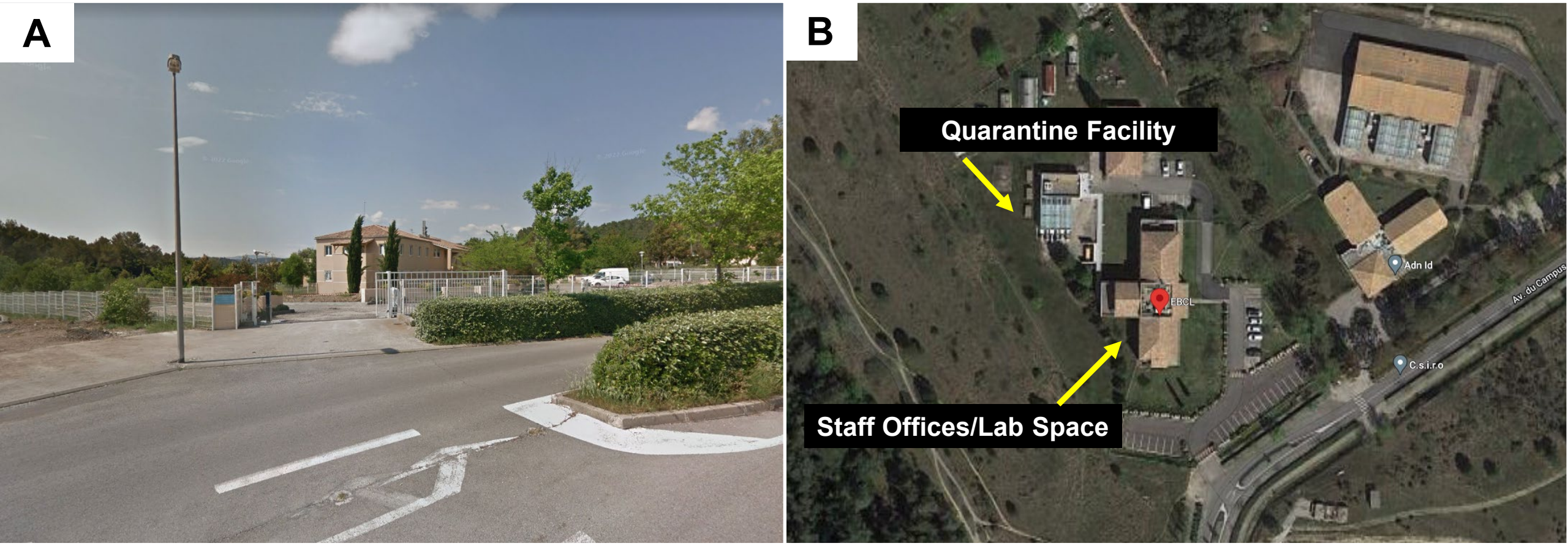


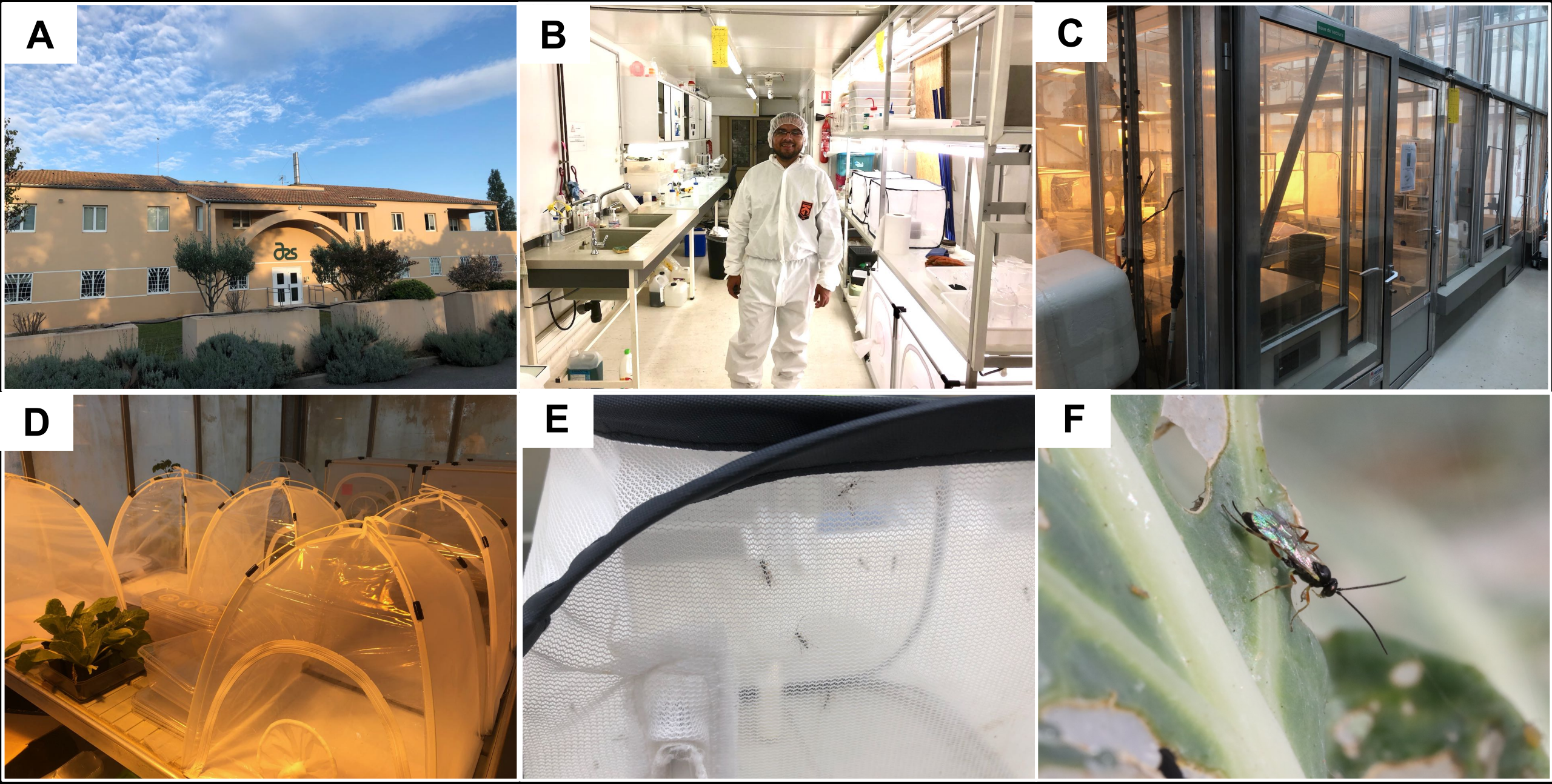



1
10 hr 35 min
from $965
Los Angeles International Airport
Paris Charles de Gaulle Airport
United States
Mexico
Germany
Ireland
Poland
Belarus
Ukraine
Romania
Italy
Spain
Portugal
Greece
Turkey
Turkmenistan
Syria
Iraq
Iran
Tunisia
Morocco
Algeria
Libya
Egypt
Western Sahara
Saudi Arabia


2
Netherlands
London
Germany
Belgium
Luxembourg
Prague
Paris Beauvais Airport
Paris Charles de Gaulle Airport
Orly Airport
Munich
Austria
France
1 hr 20 min
from $143
Milan
Slovenia
Croatia
EBCL
Montpellier-Méditerranée Airport
Italy
Andorra
Barcelona
Rome
Porto
Madrid
Portugal
Spain
Valencia
Lisbon
Tyrrhenian Sea


3
Prades-le-Lez
Saint-Gély-du-Fesc
EBCL
Combaillaux
Castries
A9
A709
Baillargues
Valergues
Clapiers
Vendargues
D986
D65
Grabels
Le Crès
Lansargue
28 min
28 km
Castelnau-le-Lez
A9
N109
Juvignac
Montpellier
Mauguio
Candillargues
A709
D132E2
Pignan
Saint-Jean-de-Védas
D66
Étang de l'Or
A709
Lattes
Pérols
D62
D612
Fabrègues
CARNON
A9
Palavas-les-Flots


A
B
Quarantine Facility
Staff Offices/Lab Space
EBCL
Adn Id
C.s.i.r.o
Av. du Campus


A
B
C
D
E
F


A
B
C
D

Diadromus collaris

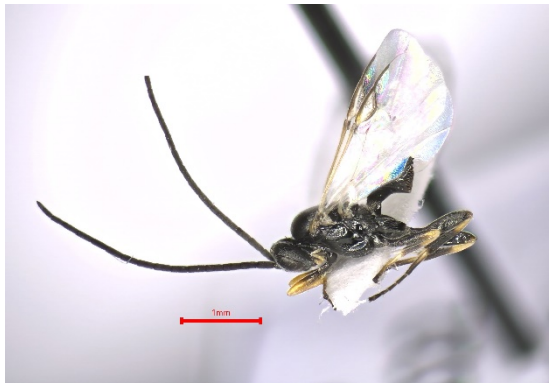
Cotesia vestalis

Oomyzus sokolowski

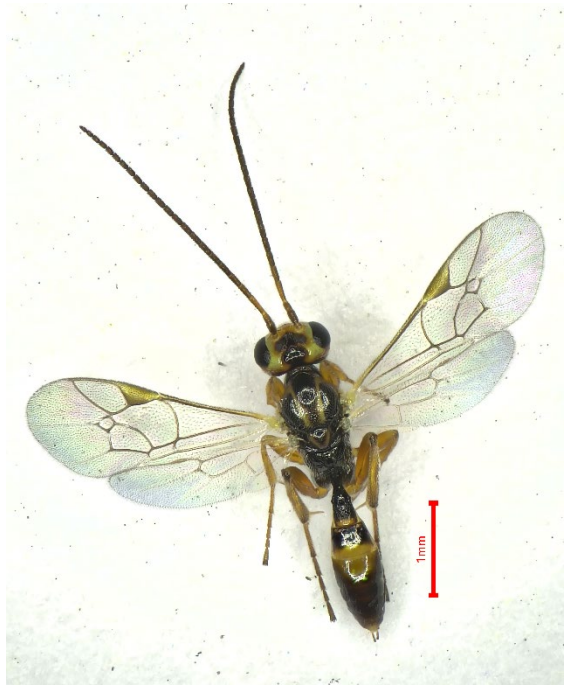
Pteromalus chrysos
(Hyperparasitoid)

Diadegma fenestrale

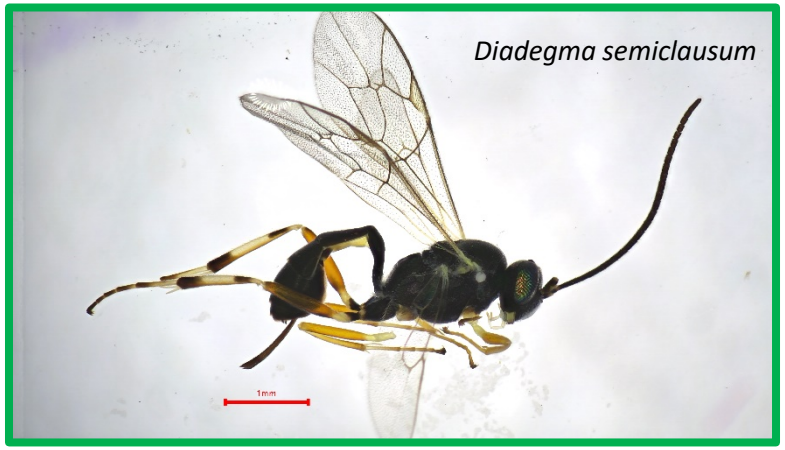
Diolcogaster claritibia



Dolichogenidea appelator



Mesochorinae sp.
(Hyperparasitoid)



Diadegma semiclausum

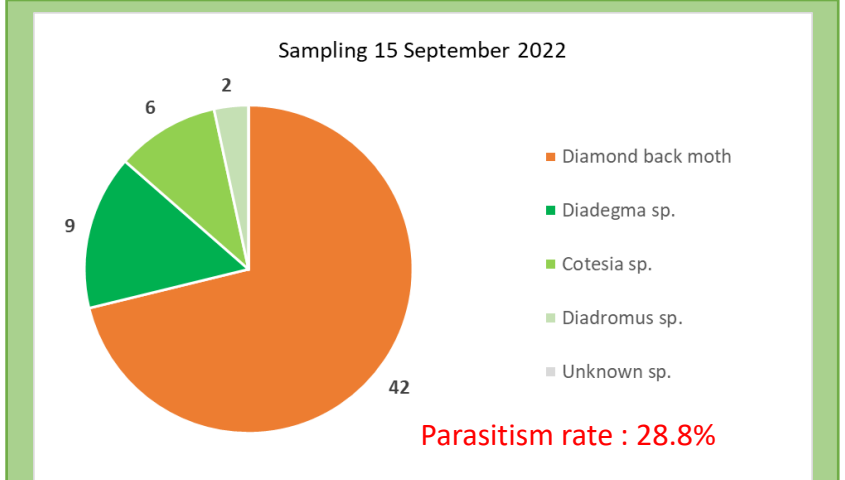
Dolichogenidea sicaria

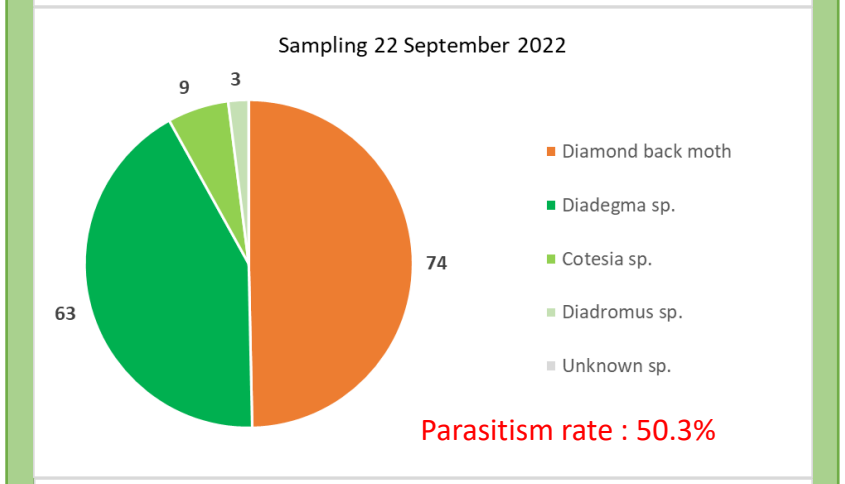
G. Desurmont

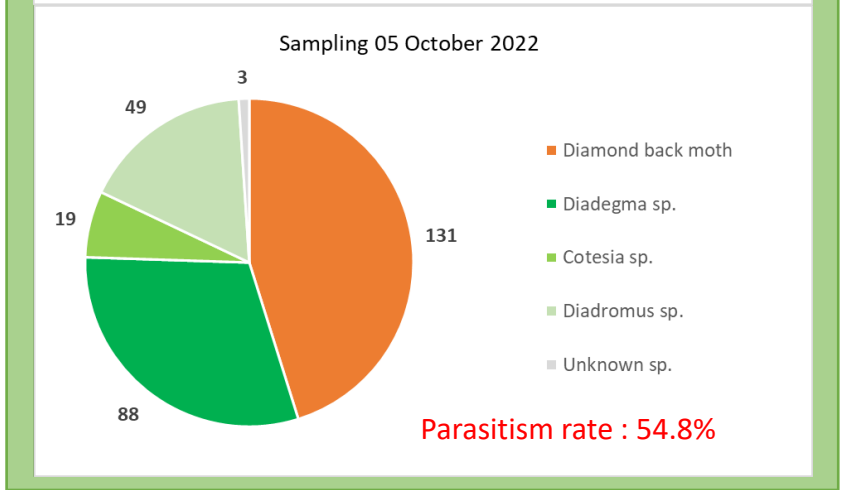
Diadromus collaris

Cotesia vestalis

Diadegma fenestrale







G. Desurmont

Future Directions

- Foreign exploration in Africa (Kenya, South Africa)
- Establish lines of parasitoids
- Send EBCL a California DBM strain for parasitoid screening
- Run studies under simulated California conditions

What about DBM egg parasitoids?

DBM Eggs (hard to find)

Sentinel Egg Cards

Commercial Trichogramma

Inundative BioControl


Thank you!