Mediterranean Oak Borer (MOB)

Xyleborus monographus

Distribution, Hosts, Symptoms of Attack, and Life History as an Invasive

MOB Pest Complex Website https://ucanr.edu/sites/mobpc/

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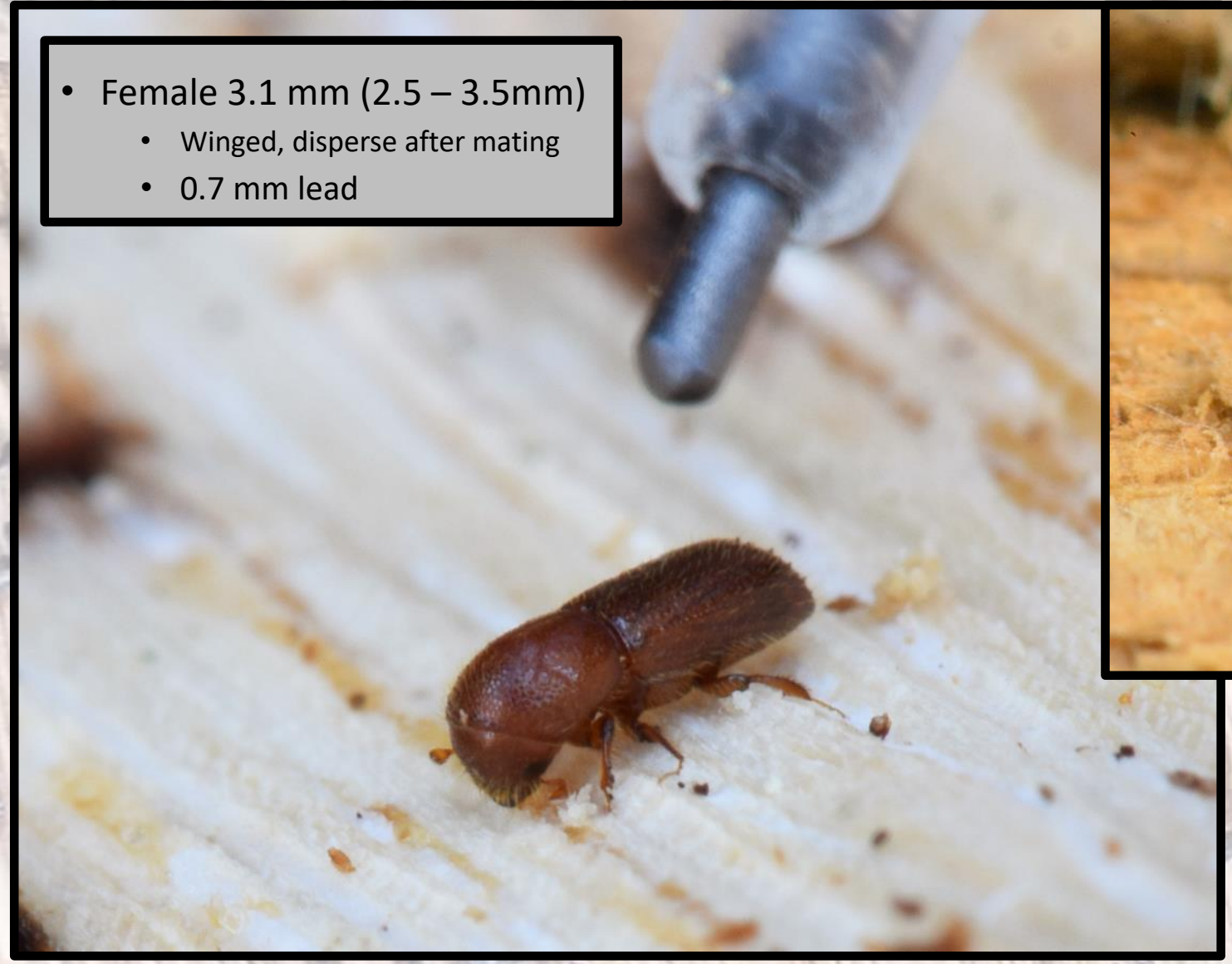
Native Range

- ***Xyleborus monographus*** **is an invasive pest Native to Europe-Middle East -North Africa**
- **Prefers Mediterranean Climates**
- **One specimen trapped in Oregon in 2018**
- **Probably in Napa for at least 5 yrs.**

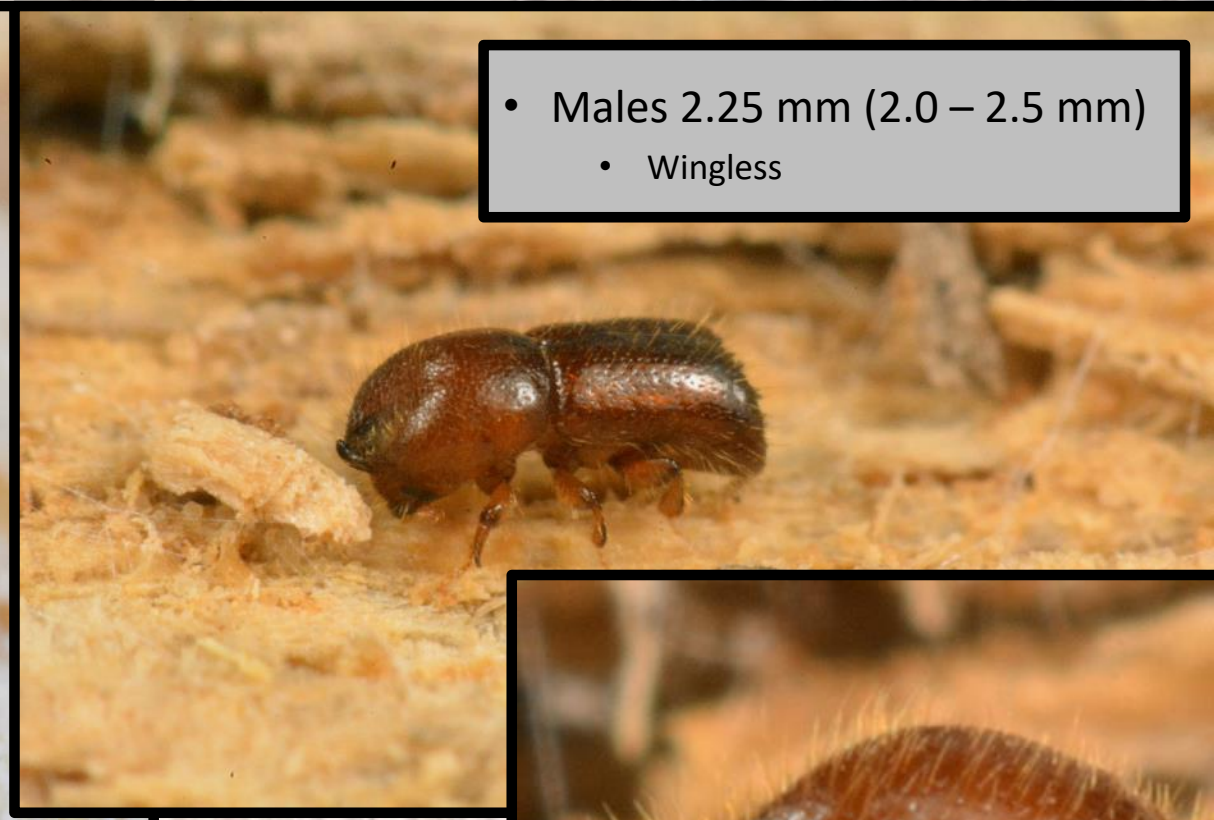
FEMALE

MALE

- Female 3.1 mm (2.5 – 3.5mm)
  - Winged, disperse after mating
  - 0.7 mm lead

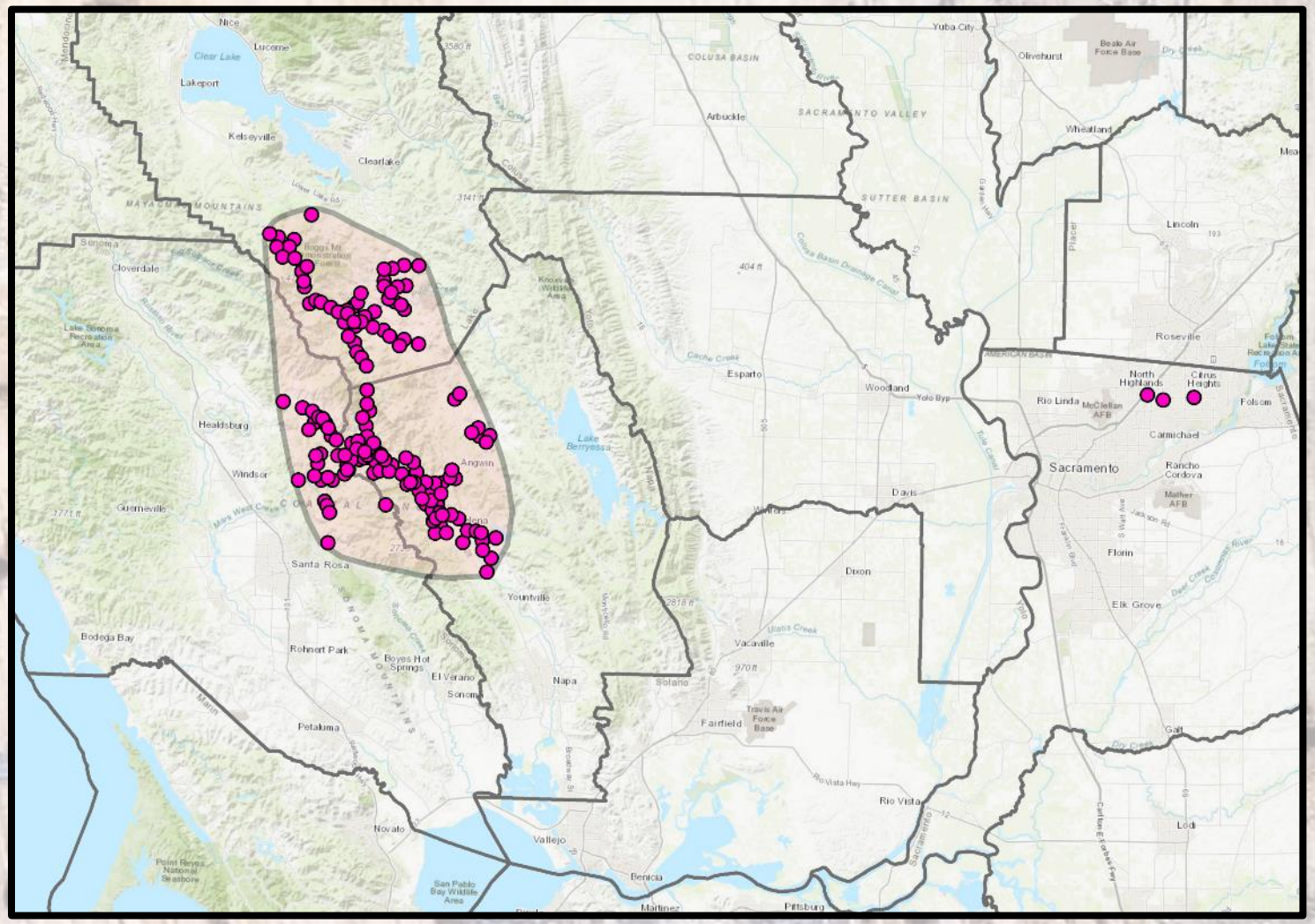


- Males 2.25 mm (2.0 – 2.5 mm)
  - Wingless



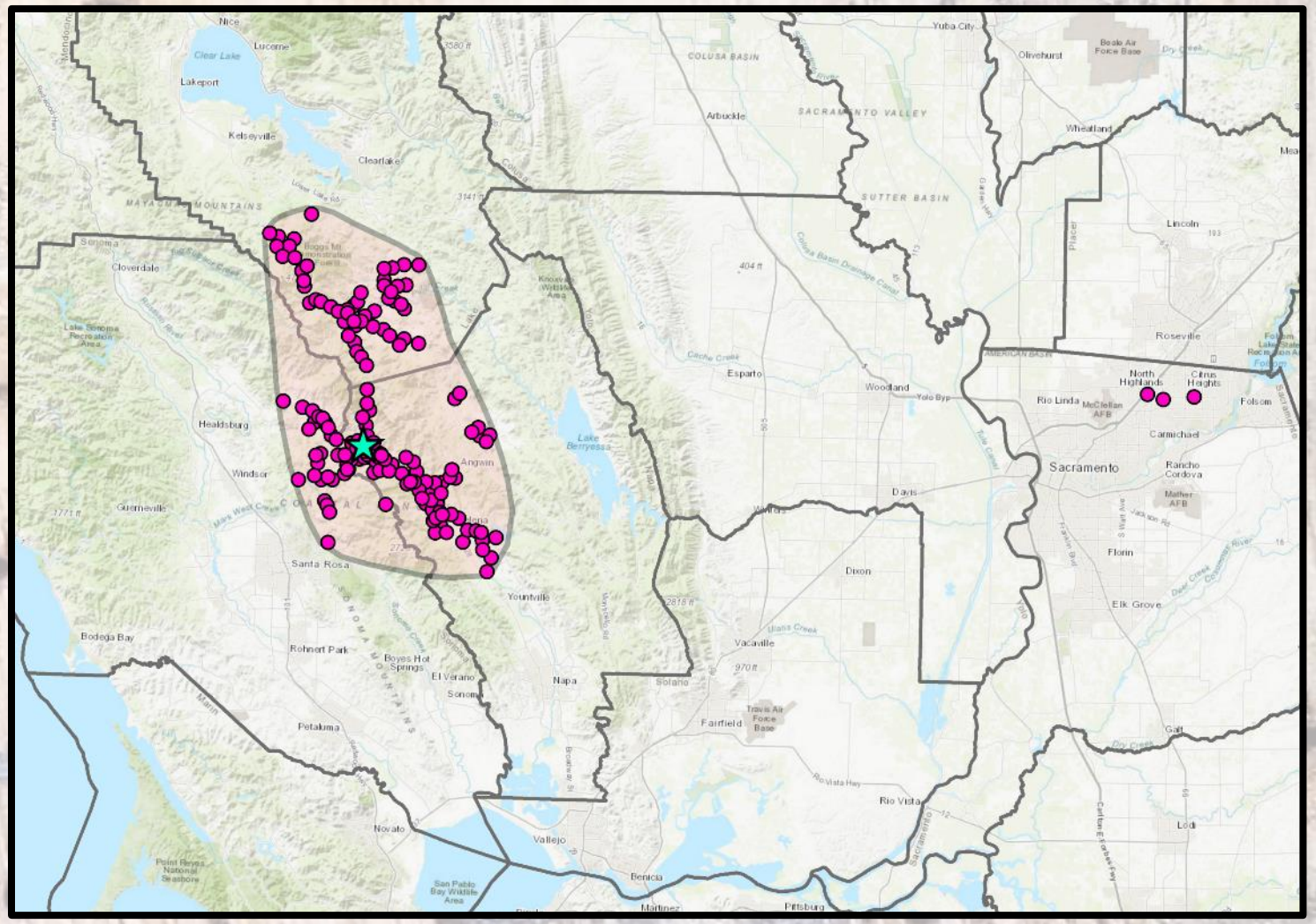
Known Extent of Infestation

- First collected Sept 2017
  - Beetle not identified
- Recollected Oct 2019
  - Identified as invasive
- Napa county
  - Calistoga
  - South to Rutherford
  - East to Pope Valley (Angwin)
- Lake county
  - To just south of Clear Lake
- Sonoma county
  - Hills west of Napa
  - Between Healdsburg and Santa Rosa
- Sacramento county
  - Citrus Heights area
    - Greenback Ln. corridor



Known Extent of Infestation

- Center of Infestation
- Trees in Tubbs/Bennett Ln.
  - Evidence of old attacks
    - Tree felled and decaying on ground for multiple years
    - Extensive galleries indicating infestation years prior to felling
  - Min 5 years ago, possibly 10 years ago



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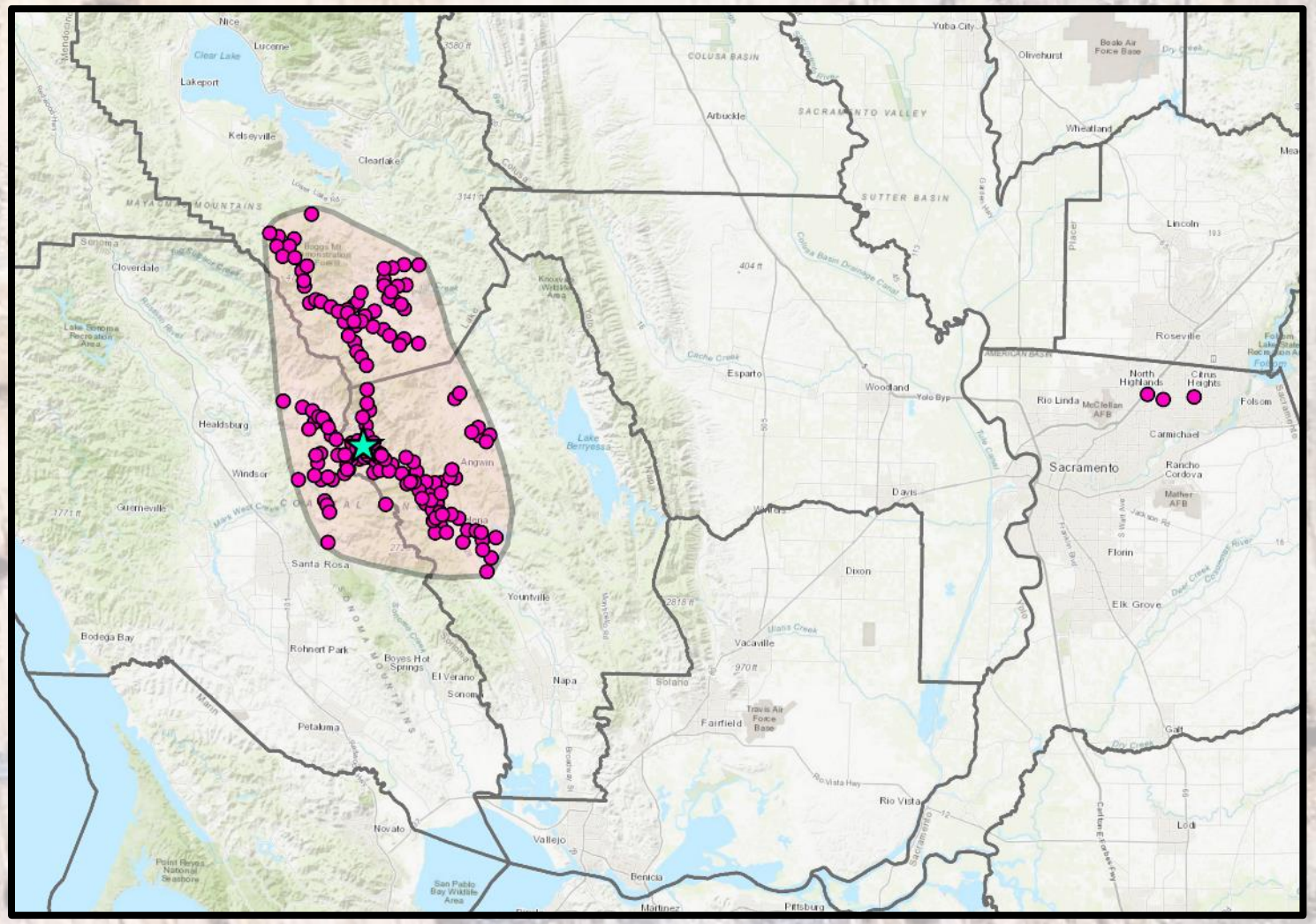
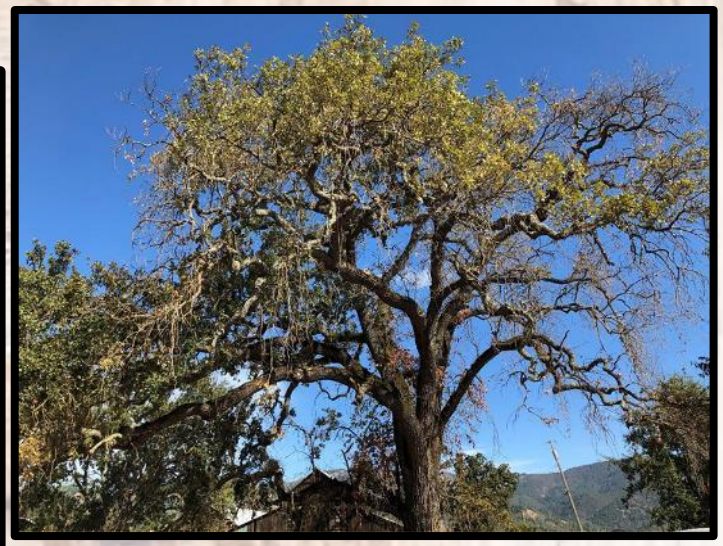
- **Ecological Constraints on Distribution:**
- Sea level to 2,000 ft. Highest population densities below 1,500 ft.

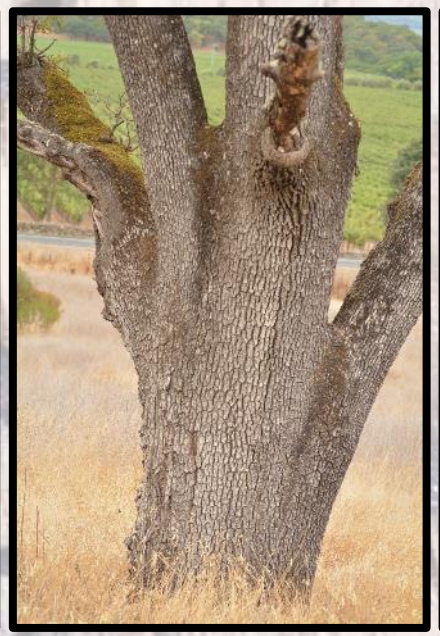


Host Trees of *X. monographus*

- Primarily associated with:
- Oaks in the white oak section
  - California
    - Primarily on valley oak
      - *Q. lobata*
    - Less common on blue oak
      - *Q. douglasii*
    - Not documented on the third white oak: Oregon oak
      - *Q. garryana*






Host Trees of *X. monographus*

- In Napa Opportunistic attack on declining tree
  - One heart rotted branch of Black Oak
  - Surrounded by heavily infested valley and blue oaks
- Europe less commonly on
  - Maple, Walnut, Beech, Elm, Chestnut, Cherry, Hornbeam

Symptoms of Attack

- Best evidence are the branching, black stained galleries
- Galleries penetrate throughout active xylem (or nearly so) in a single plane
  - Weakens branches
- In most cases they attack branches in the upper crown first
- Infestation moves down
- Dead branches clustered on one side until reaches main bole
- Usually do not attack heart wood

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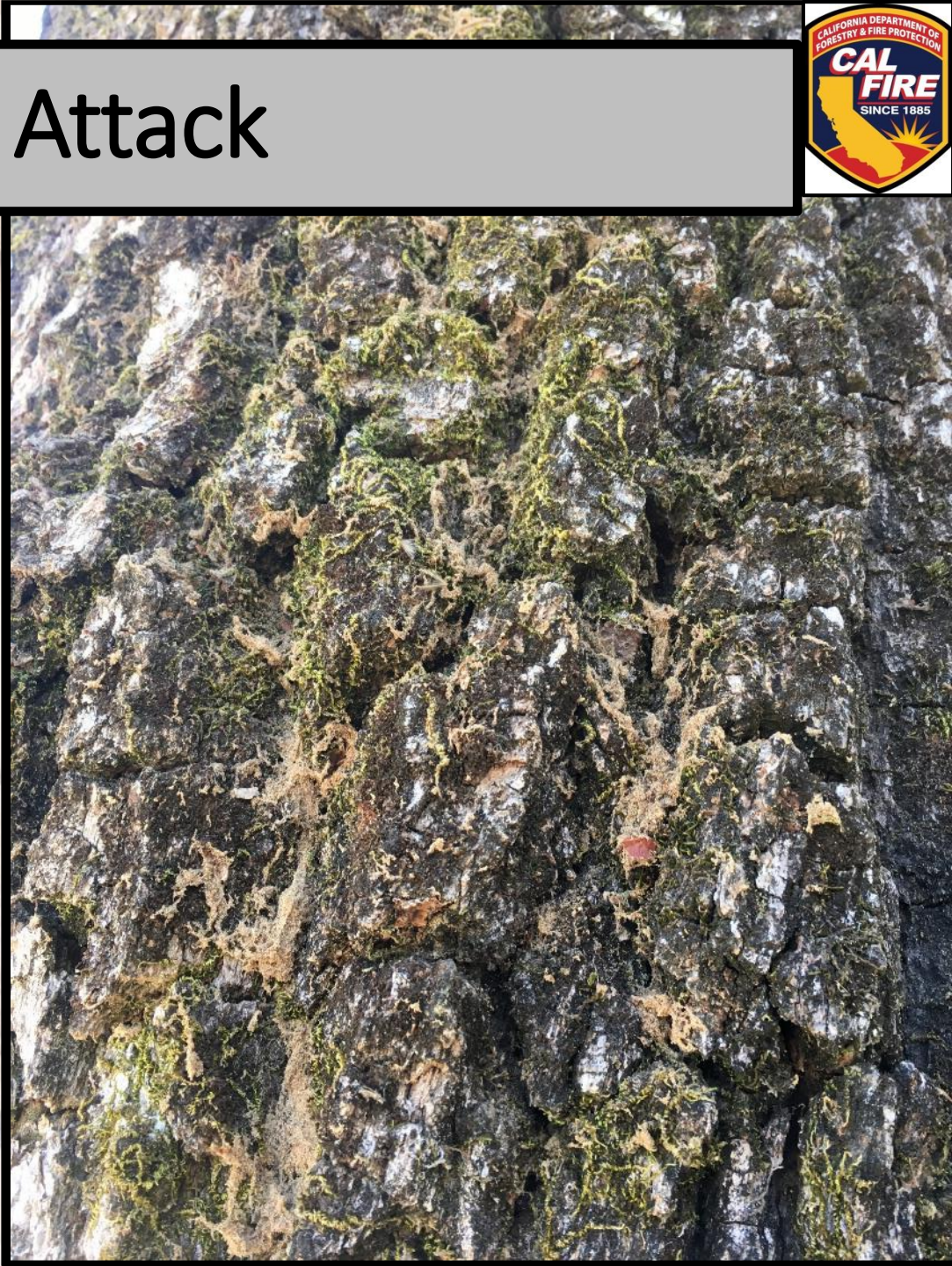
- In advanced infestation the bole will also be infested
  - **Boring Dust on the bark**
  - In the bole the outer xylem is infested first (ray parenchyma)
  - In Valley Oak there is also staining of the tissue between the galleries
  - In Blue Oak staining is absent or faint
    - Caveat: small sample size



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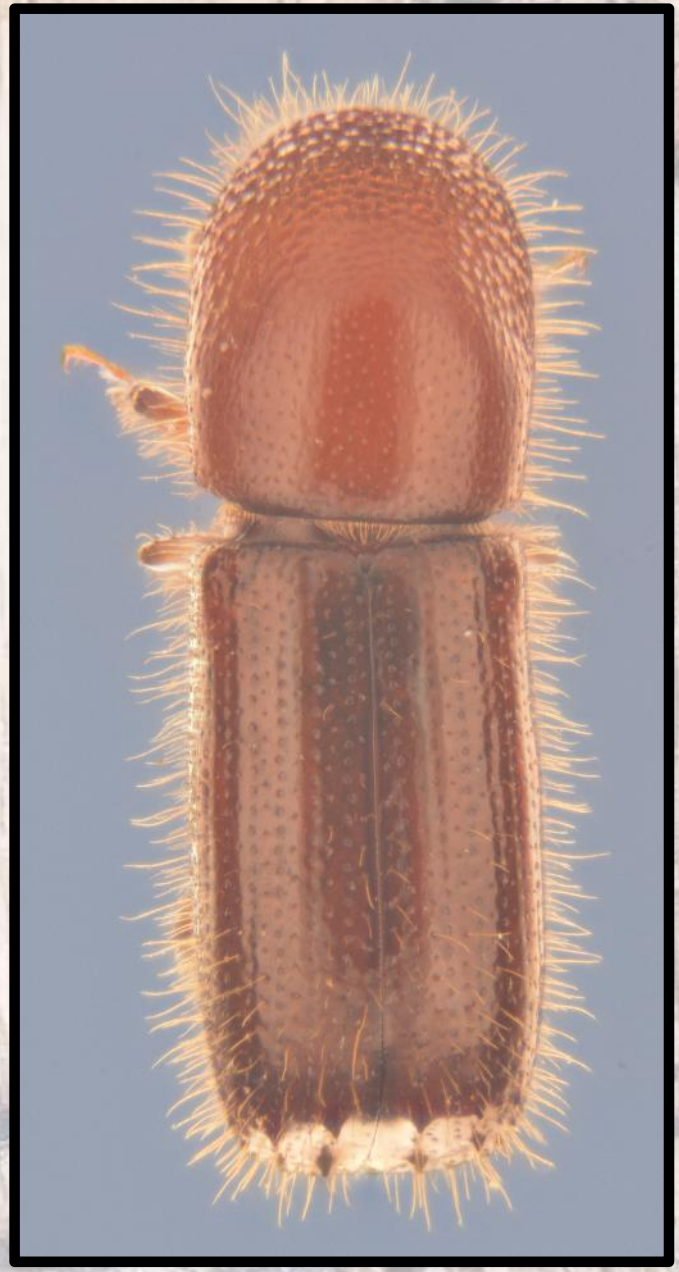
Current Research

- **Funded by USDA-FS Region 5**
  - **Sheri Smith (Funding)**
  - **Michael Jones UC-ANR (PI)**
  - **Curtis Ewing & Chris Lee (Co-PIs)**
- Review of historical aerial imagery
  - Look for evidence of origin of infestation
  - Track spread over time
- Track spread and monitor decline
  - Nov. 2020 tagged 185 valley oaks in St. Helena and Calistoga
- Randomly select plots within infested forest and track health of valley and blue oaks
- Trapping in Calistoga & St. Helena to determine:
  - Dispersal flight patterns in time
  - Dispersal flight patterns in space: ground and/or canopy level
  - Evaluate efficacy of cross-vane panel vs. Lindgren funnel traps
  - Evaluate High Release Ethanol (HRE) vs. *Platypus cylindrus* lure



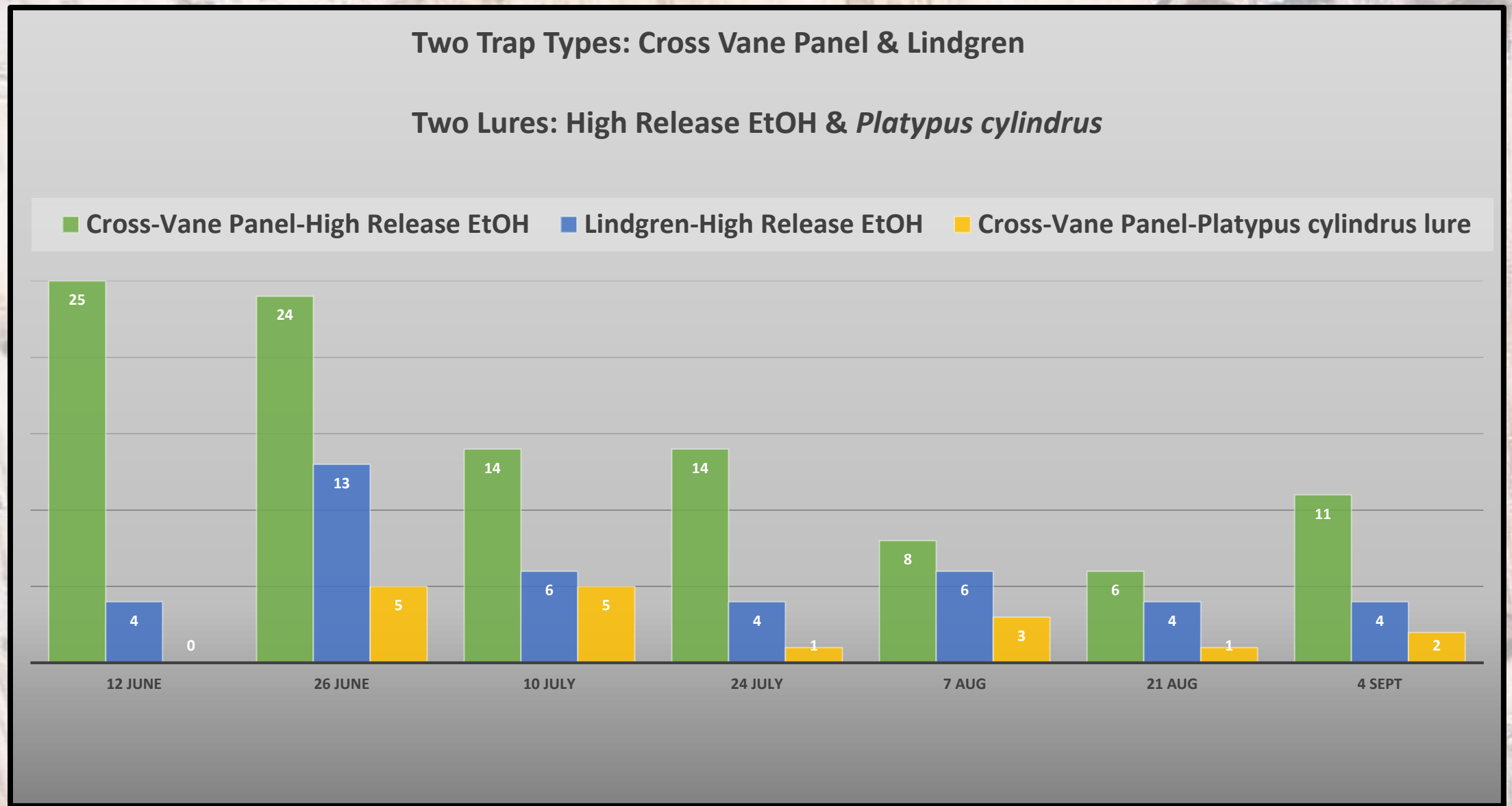
Trapping to determine Dispersal Patterns

- Trapping in Napa Valley
- Funded by USDA-FS: Sheri Smith
  - Calistoga & north St. Helena
- 5 sites from June to September 2020
  - One preliminary site in May
- 5 trap types
  - (1) Cross-vane panel trap
    - High release ethanol 100ml sleeve
  - (2) Cross-vane panel trap
    - Synergy *Platypus* bubble lure
      - Leaf alcohol, Ethyl alcohol, Sulcatol, Sulcatone
  - (3) Lindgren funnel
    - High release ethanol 100ml sleeve
  - Sticky traps - Unbaited
    - (4) One at ground level
    - (5) One in canopy

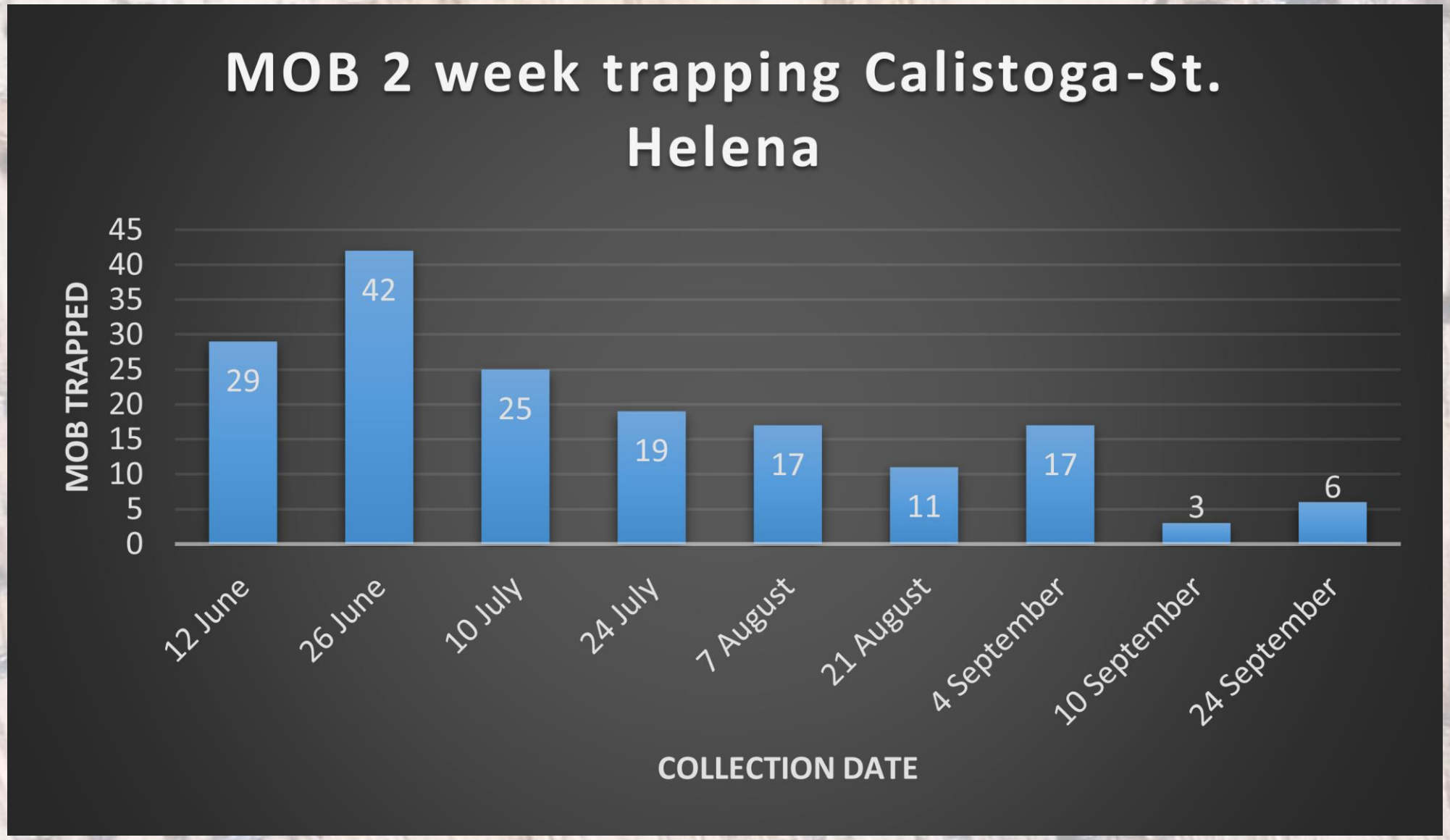
Trapping Overview

- **RESULTS**
- June – September
- Two baited with Synergy 100ml high release ethanol sleeves
  - Cross-Vane Trap: 111 MOB
  - Lindgren Funnel: 44 MOB
- *Platypus cylindrus* lure
  - Cross-Vane Trap: 17 MOB
- Sticky Traps – Unbaited
  - 0 MOB

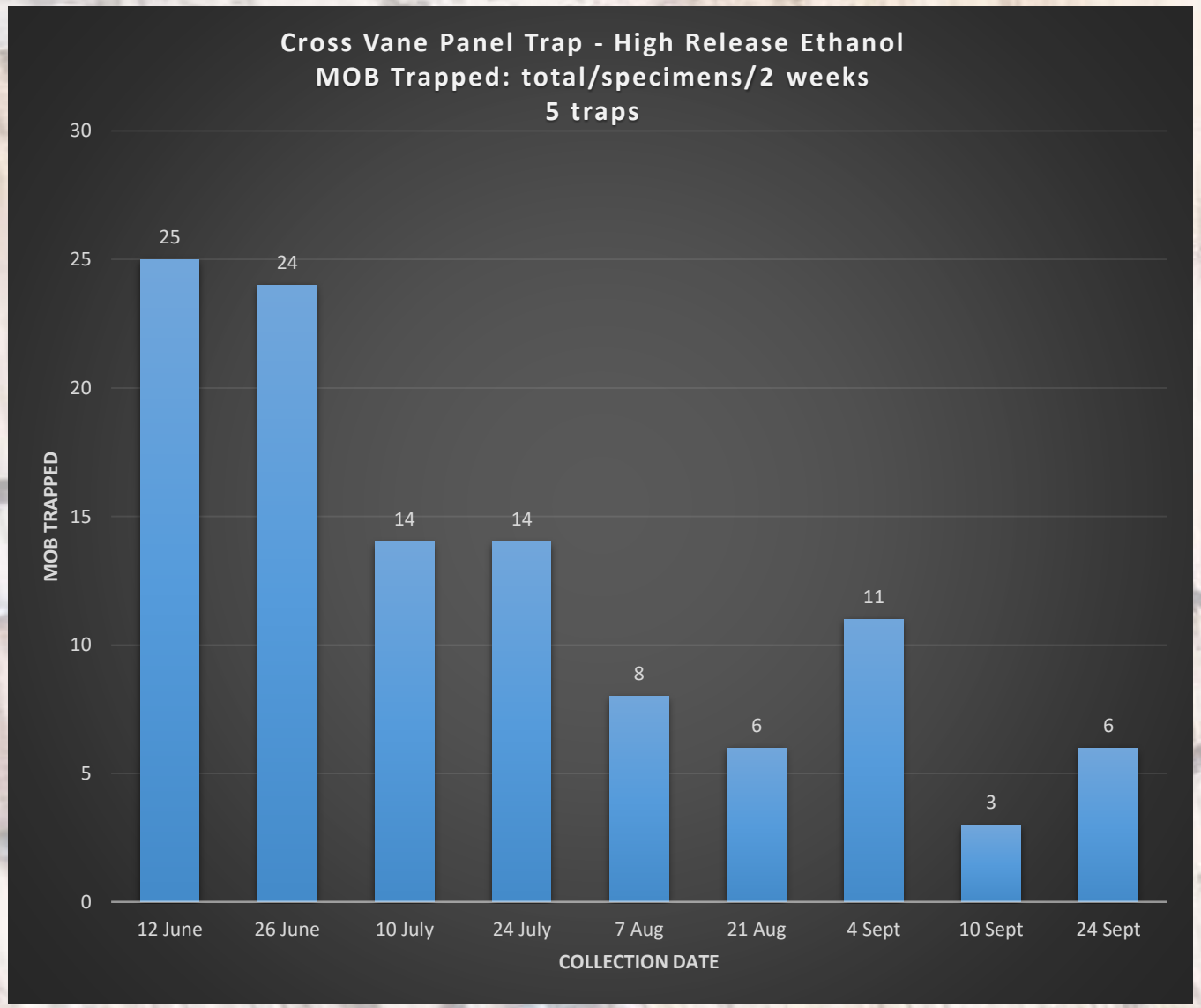
Trap Type and Lure Evaluation

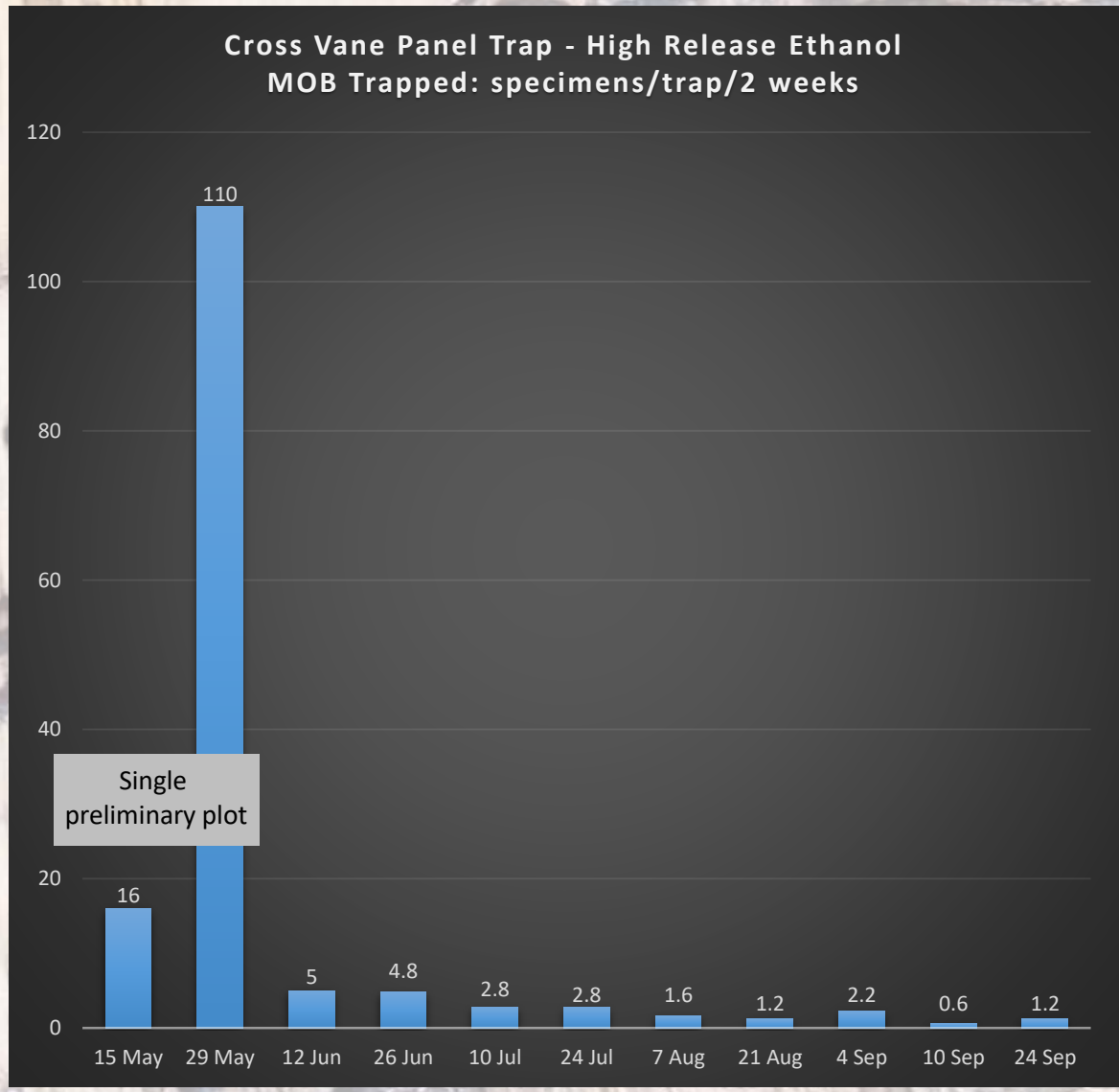


Trapping: Total MOB



Trapping: Cross-vane Panel with High Release EtOH





Native range Life History

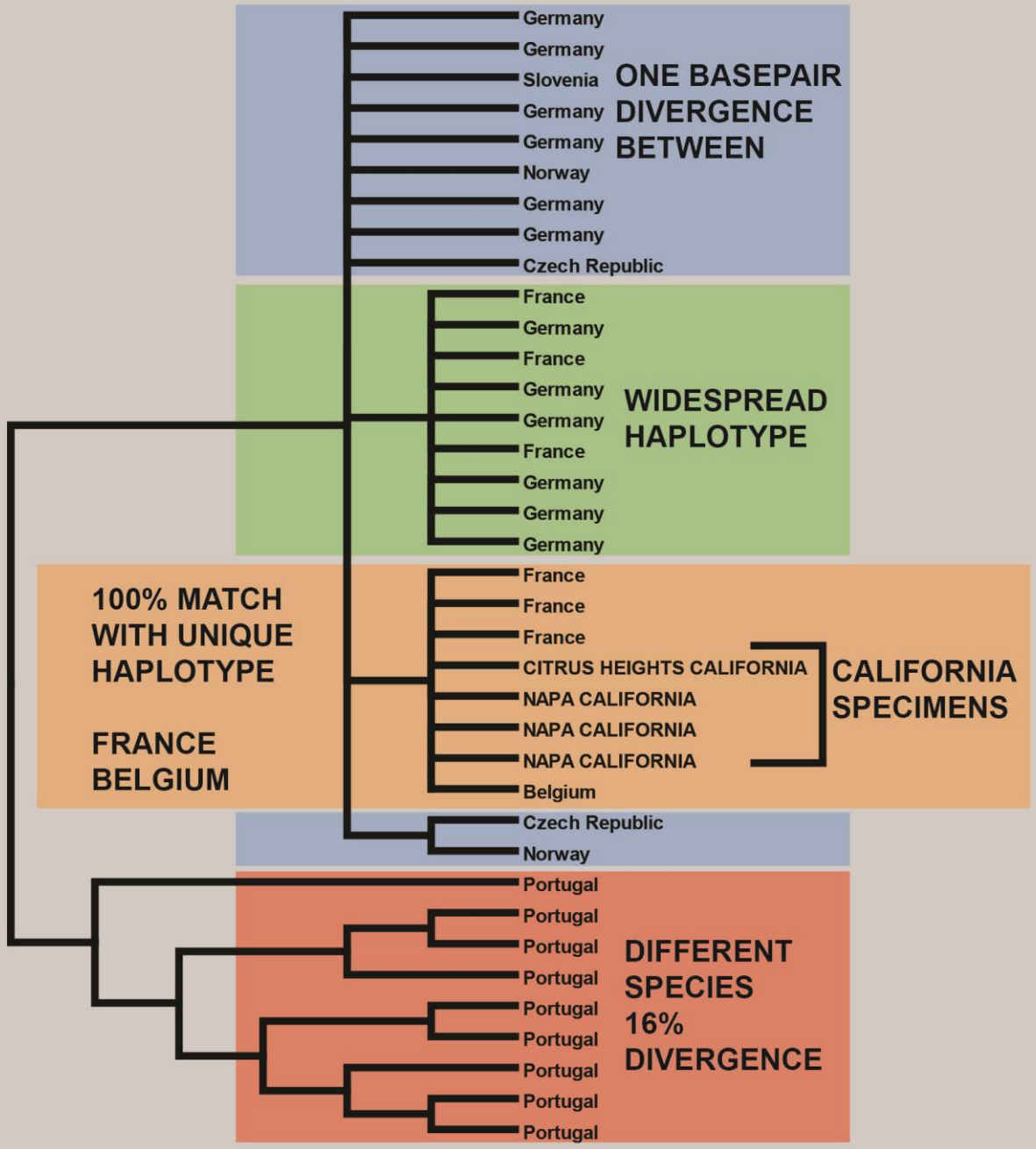
- Two peaks of dispersal activity (most areas)
  - March-April
    - Overwintered, mated, females
    - 6-8 week development time (Schedl 1964)
  - June-July
    - Founding second annual generation
  - SINGLE GENERATION IN SOUTHERN SCANDANAVIA
- Pers. Com. Milivoj Franjević (U of Zagreb)
  - Attack dropped limbs and dead wood
  - **Only one generation/attack due to steady decline in water content**
  - Reproductively active whenever T is ≥ 45^{o} F for 3 days in a row
  - 5th tier pest = least important
- Schedl 1964, dissected 50 galleries, 1 with multiple generations

Altered Life History as Invader

- **<u>Results of trapping study and hand examination of infested trees</u>**
- One long peak dispersal period detected
  - February – May when temperature >80^{o} F
  - Dissection of trees with overwintering brood detected slow decline in numbers from Feb until late May when all were gone
- Attack live trees, NOT dead branches
  - Water content does not fully decline until wilt
  - Multiple overlapping generations produced
  - Observed from June through early October
    - At least 3 generations produced
    - Numerous eggs and early instar larvae still observed in Oct.

Altered Life History as Invader

- Attack initiated in uppermost limbs ~8” diameter
  - Dissection of 2 valley oaks Sept 30 & Oct 1 in Citrus Heights
    - Initial attacks not very successful
    - Long, sinuous, probing galleries with most failing
    - A few small brood chambers during 1st generation
  - Infestation proceeds down branch
    - Gallery excavation and brood chamber construction increase
  - Infestation encounters Y
    - Only infest second branch back upward a short distance, <1 meter
  - Proceeds downward & tends to kill branches on one side
  - Reaches area where all main branches meet on main bole (White Arrow)
    - Girdles tree, full wilt
  - **Attack → Full Wilt** in large trees appears to require at least 3 years
- In Europe always fly <50 ft.
  - In CA do they fly higher of climb to top?



PARSIMONY: 50% CONSENSUS

Possible Origin

- Cytochrome oxidase I
  - Barcode (Folmer) REGION
- 35 GENBANK SEQUENCES
  - 2 FROM NAPA
- 2 CDFA GENERATED
- PORTUGAL SPECIMENS
  - 16 - 17% pairwise divergence
  - DIFFERENT SPECIES
  - Not contamination: 5-6 Amino Acid changes
- Small differences across rest of Europe (0.0-0.7%)

- CALIFORNIA SEQUENCES ALL THE SAME
- 100% MATCH TO UNIQUEHAPLOTYPE
- LIMITED TO FRANCE AND BELGIUM

Acknowledgements

WEBSITE: https://ucanr.edu/sites/mobpc/

- Sheri Smith USDA-Forest Service
- Michael Jones – UC-ANR
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- Bob Rabaglia – USDA-FS
- Milivoj Franjević – U of Zagreb
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- Chris Lee – Cal Fire
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- Toosdi Malito – Napa Ag. Commission
- Jake Schneider – Pacific Tree Care
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- David Pegos – CDFA
- Nick Condos – CDFA
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