Bark Beetle Damage in Greece

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1. Affected species

- Softwoods

e.g. Brutia pine, black pine and scotspine attacked by:Tomicuspiniperda/minor,Orthotomicus erosusandIpssexdentatus

- Hardwoods

e.g. *Ulmus* sp. attacked by *Scolytus* sp that also transmit the Dutch elm disease (*Ophiostoma novo ulmi*).

2. Severity

- Variable but in the last years there is a constant increase of intensity and frequency.

3. Timeframe

- The gradual intensification of the damages initiated in the beginning of 2010's

References:

1) Avtzis ND, Vidakis K, Avtzis DN. (2013) Forest Insects of Greece. Photo/Graphs Studio E.E. [in Greek]

2) Caudullo, G., Welk, E., San-Miguel-Ayanz, J. (2017) Chorological maps for the main European woody species. Data in Brief 12, 662-666. DOI: doi.org/10.1016/j.dib.2017.05.007



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4. Most important causes and key factors Natural

- Increase in the duration of drought periods during spring and summer time (makes trees more susceptible to bark beet<u>le attacks</u>).
- Increase of mean temperature during winter time (allows bark beetles to continue their devel ment and on the same time, does not c freeze-induced mortality in their populatio

Anthropogenic

- The management practices employed in the past were not as intense as needed, resulting in surplus of weakened trees, growing under unfavorable conditions (too dense stands).



References:

 Avtzis ND, Vidakis K, Avtzis DN. (2013) Forest Insects of Greece. Photo/Graphs Studio E.E. [in Greek]
Google earth 7.3.3.7786 (64-bit). (May 11, 2019). Thessaloniki, Greece. 40° 37' 25.78"N, 22° 59' 37.43"E, Eye alt 1540 meters. Maxar Technologies 2020. http://www.earth.google.com [Januar 6, 2021].

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The chestnut Gall Wasp, Dryocosmus kuriphilus Yasumatsu Status in Greece

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1. Affected species

- Species of genus Castanea (in Europe: Castanea sativa)

2. Severity

- Since its first detection in Greece (2014), it gradually increased its

impact on chestnut production. Now it is estimated that D. causes a reduction of about 30% in chestnut

kuriphilus production.

3. Timeframe

- In less than a decade, *D. kuriphilus* expanded to every chestnut stand (both orchards and natural stands) of continental Greece.

4. Most important causes and key factors Natural

- Reproductive behavior (parthenogenesis) of *D. kuriphilus* / lack of natural enemies.

Anthropogenic

- Human-mediated transport of goods / products and plants-for-planting

References:

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5. Remote sensing detection and monitoring

- Local aerial surveys; research: RGB camera survey from UAV, comparisons to ground observations.

6. Thesis goal – alternative goals

- Primary goal: to identify and map the extend of the infestation with low - cost methods. Secondary goal: to detect dead trees due to fungal infections

7. Hardware equipment

- Multirotor UAV equipped with a 20-megapixel camera.

8. Detection capabilities and observations on the infestation

- Leaves infested by the wasp, do not fell off during winter time. They remain on the tree and they form a knot – like shape.

9.1 Most important RGB limitations

- Spatial resolution of 20MP is not enough at an altitude of 50m AGL.
- Serious background removal issue.
- 2D approach is misleading because of the rest trees' leaves on the ground surface.

References: 1) Tselepis, A., Gitas, I., Avtzis, N.D.(2021). *Development of Methodology to Detect and Map Infestetions on Castanea Sativa Forest Stands with the Aid of UAV Platforms.* (Master's Thesis, Aristotle University of Thessaloniki, Thessaloniki, Greece) (On going).







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9.2 Most important RGB limitations

- The 3D model can not be reconstructed at large detail.
- Thinner brunches that retain the dead infested leaves can not be reconstructed.

10. Future research potential

- Simultaneous use of LiDAR and high resolution (>40MP) sensors on the UAV platform.
- Better quality tree model.
- Testing of different OBIA detection methods.

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References: 1) Tselepis, A., Gitas, I., Avtzis, N.D.(2021). *Development of Methodology to Detect and Map Infestetions on Castanea Sativa Forest Stands with the Aid of UAV Platforms*. (Master's Thesis, Aristotle University of Thessaloniki, Thessaloniki, Greece) (On going).



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Thank you for your attention !