Action C2.
Implementation and management of prevention, early warning, eradication and containment protocols in Circeo Park and surroundings

Deliverable:

Revised local management protocols and plans - second update 2021

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1. Summary

The Covid-19 epidemics largely perturbated the experiments planned in 2020. The monitoring program of the expansion of the beetles in the core areas had to be delayed and began only by mid-june 2020. Thus, the first generation of both beetles, emerging from mid-April to early June, was missed. Despite this,the push and pulls and mass trapping experiments were carried out showing a low infestation state and a general improvemenent.

This document lays down the protocols agreed for the management of the lure baited trapping network during 2021 in the Circeo National Park. It has been developed on the basis of the analyses of data collected during the 2020 campaign and takes into account the conclusions on selected lures and traps.

Considering the current infestation level and opportunities available in the park, three protocols have been developed jointly by Circeo, UNITUS and TS, on the basis of partnership agreements decided in January 2021:

- optimal trap density
- Push and Pull technique
- X-trap installation

The protocols will be implemented from March onwards.

2. 2021 Experimental design for defining optional trap density

Tests will involve linear transects of attractive traps placed at increasing distances from each other. The experiment is based on Jactel et al.'s study (2019) on Monochamus long-horned beetles. In this study, the range of attraction is deduced from the observation of reduced trap capture when the attraction range of two adjacent traps starts overlapping. The relationship between the relative trap capture and the distance between paired traps is fitted with a logistic curve. It will thus allow to define the best distance for trap density.

The experiment will follow the same design in all countries:

1- By late February, select in the forest (park) 5 clear cuts, or edges, long of 110m.
2- By early March, deploy on each transect 5 traps placed at increasing distances of 0, 10, 20, 30, and 50m, and baited with the combination of the 4 attractants (Ethanol, a-pinene, quercivorol, a-copaene), and the collector with insecticide net
3- Collect the trapped beetles every 3 weeks until November
4- Change repellents and attractants, and insecticide every 6 weeks

Site proposal

- 5 site in Italy

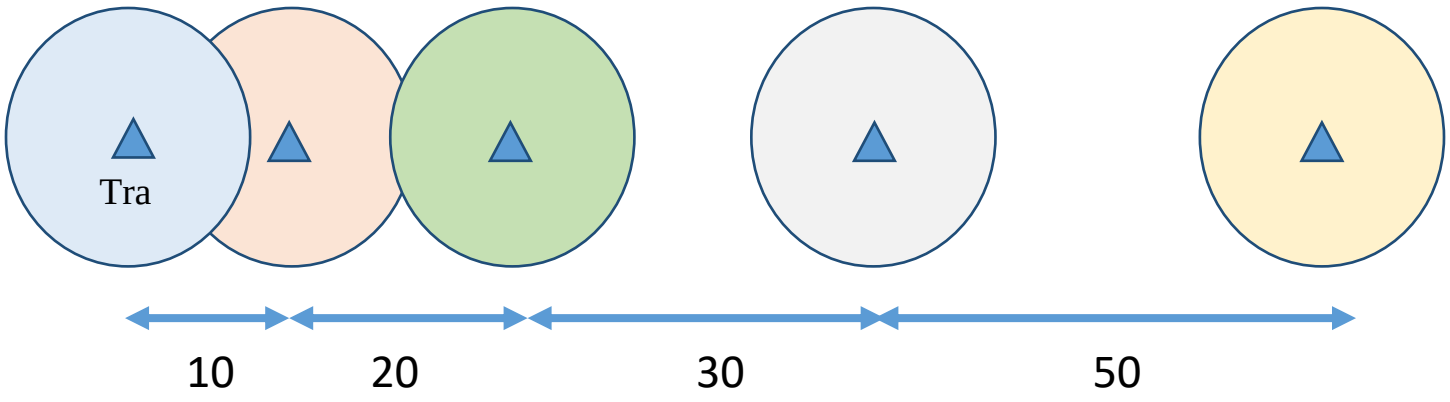

Fig.1 Summary scheme of linear transec

The five sites identified are: one along the path in Quarto Freddo locality, were the traps of early warning were located, one along the path through the forest and the other three transept will be positioned along the forest boundaries.

Fig. 2 Sites of linear transect in the National Park

3. Push and Pull

The new protocol of push and pull ideated for the monitoring season 2021foresees to select at the forest (park) edge 4 square blocks of 20m x 20m, based on confirmed presence of Xylosandrus spp., leaving a buffer row of at least 20m between successive blocks. Than we estimate by late February (before first emergence of female beetles) the previous extent of damage by selecting 10 trees per block in a random zig-zag walk selection of 10 plants. On each of these plants, count exit holes and other visible damage on trunk, on 10 branches and on 10 last year shoots. Just after this estimation (ie., late February-early March at last), settle the experimental design using Verbenone as repellent and the combination of the 4 attractive components (Ethanol, a-pinene, quercivorol, a-copaene) as attractant (and insecticide in the collector):

a. Block 1- Push-pull (VA): a Verbenone dose in the center of the block stapled on a trunk and 4 traps baited with attractants at the periphery of the block
b. Block 2- Push (V)- Test of repellent efficacy: a Verbenone dose in the center of the block stapled on a trunk, and no attractant at the periphery
c. Block 3- Pull (A)- Test of trapping efficacy: 4 traps baited with attractants at the periphery of the block, no verbenone
d. Block 4- control: no repellent, no attractant

We will collect the traps of blocks 1 and 3 every 3 weeks until July (first dispersal flight supposed ended)- 6 checks; Count Xylosandrus spp. per trap, change repellents and attractants, and insecticide every 6 weeks (ie, 3 changes) in blocks 1, 2, and 3. Finally we will estimate the resulting damage per block similarly as in 2. In the 4 blocks, check 10 plants per block through a random zig-zag walk. On each of these plants, count the exit holes and other visible damage on trunk, on 10 branches and cut 10 apical shoots ca. 50 cm long.

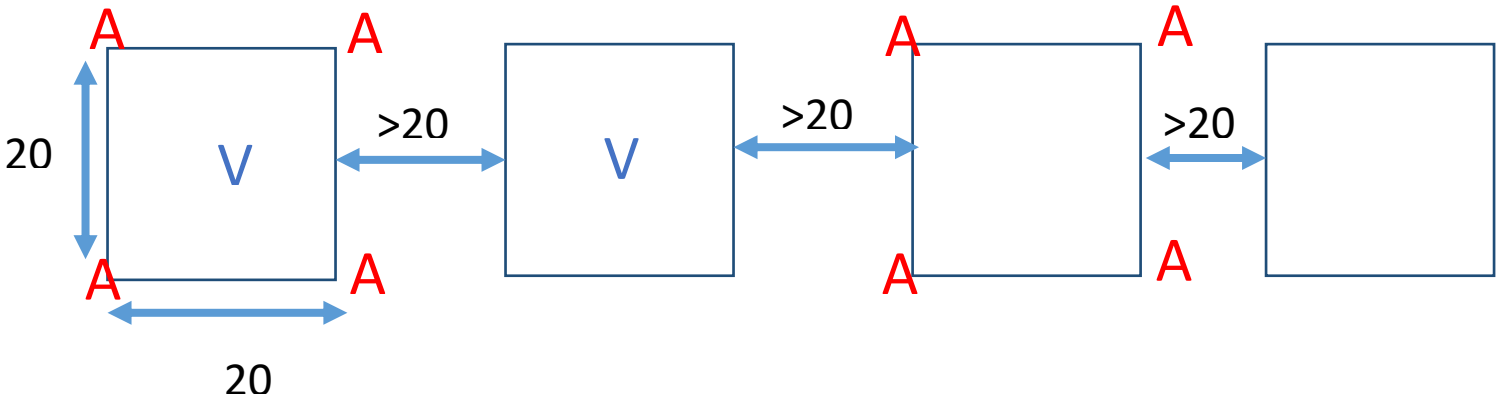

Fig 3: Scheme of push and pulls protocol

Fig. 4 Push and pull sites in the national Park

4. X-traps

The X-Traps, designed and developed within the SAMFIX project by Terrasystem, are IoT modules that can be integrated into traditional traps such as the Crosstraps produced by Econex but also adaptable to other types of traps. They allow to count and recognize daily Xylosandrus captures through the acquisition and recognition of high resolution macro photographic images. Further images are acquired to evaluate the vegetation of the tree where they are installed and the filling of the collection collector of the trap itself as diagnostic data. The X-Traps are also equipped with a GPS / Glonass satellite receiver, a thermo-hygrometer that acquires hourly temperature and humidity data and a 3G modem for daily data transmission to the Terrasystem cloud server, through which it is also possible to configure them remotely. Powered by solar energy, the X-Traps are suitable for use in all types of environments. After the successful completion of the field test campaign at the Circeo National Park (Italy), X-Traps will be installed in the core sites of the SAMFIX project, for the 2021 trapping campaign, of which 8 at Circeo.

Fig. 5 one of the two X- Trap installed in the Circeo National Park during the preliminary test

5. Other monitoring traps

20 traps will be installed in order to support the activities related to the C1 remote sensing action with data on the ground. The traps will be installed in the areas of the Park not covered by the sampling methods described above.

The data taken through the traps will be accompanied by ground surveys on the state of xylosandrus infestation by monitoring the state of the vegetation on points established during the last sampling year.

6. Conclusions

This year, in which the monitoring season will start on time, we expect more accurate data collection then we could achieve during 2020, hoping that the Covid-19 emergency does not alter the planned monitoring activities.

New data will help us to define a golden standard in managing ambrosia beetle invasion in natural envoironments.