Action C4

Implementation and management of prevention, early warning, eradication and containment protocols in Antibes, Ile Ste Marguerite and Nice Côte d'Azur

Deliverable:

Revised local management protocols and plans- Second update

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Summary

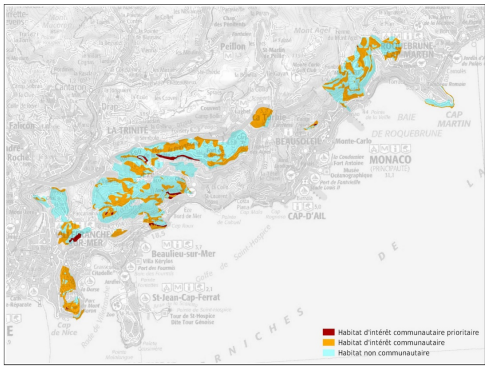
The Covid-19 epidemics largely perturbated the experiments planned in 2020. The monitoring program of the expansion of the beetles in the core areas has to be delayed and began only by mid-june 2020. Thus, the first generation of both beetles, emerging from mid-April to early June, was missed. The "push & pull" experiments had to be cancelled because the adult beetles had emerged before the possible dates for of setting up the tests.

However, the deployement of traps into new areas of the core sites, especially in the Park of Corniches de la Riviera and in 2 close natural parks, allowed to reveal the presence of both beetles in these parks. One specimen of *Xylosandrus crassiuculus* was trapped in the Corniches de la Riviera as well as in the Haute-Vallée du Var, several kilometers upwards of Nice. *X. compactus* was not trapped in the Corniches de la Riviera but it was caught in large numbers in the Park of Croix des Gardes at Cannes and in the Park of Paradou at Vallauris. Since no traps were deployed at all these sites during the previous years, it could not be ascertained if these captures corresponded to an expansion from the already invaded areas or if the beetles were already present but undetected. Both beetles were still trapped in numbers in the core sites of Ile Ste Marguerite and Bois de la Garoupe but since the first, usually outbreaking, generation of beetles has been missed, it was impossible to compare the population densities between 2019 and 2020 and appreciate the population dynamics.

The 2021 trapping network will be thus modified in order first to extend the geographic coverage of the Corniches de la Riviera Park and its associated parks, and second to survey close-by nurseries and vegetal recycling centers that are supposed to disseminate the beetles. The areas previously monitored in Antibes, Ile Ste Marguerite and Nice Côte d'Azur will be maintained. A total of 23 sites for 47 traps will be surveyed (19 sites in 2020). Taking into account the problems occurred in 2020, specific arrangements have been made to guarantee the beginning of the trappings by early April in order to allow a reliable comparison of the numbers of trapped beetles between 2019 and 2021. The same combination of 4 lures will be used on black multifunnels traps. In order to control/reduce damage by ambrosia beetles having already invaded the protected areas, "push and pull" experiments are also programmed using the repellent compound verbenone in Villa Thuret and Ile Sainte Marguerite, respectively.

1. Modification of the lure- baited trapping network

The 2020 trapping survey into new sites of the core area, in the Park of Corniches de la Riviera and in the close natural parks of Paradou and Croix des Gardes, revealed the presence of both beetles in these parks. One specimen of *Xylosandrus crassiuculus* was trapped in the Corniches de la Riviera as well as in the Haute-Vallée du Var, several kilometers upwards of Nice. *X. compactus* was not trapped in the Corniches de la Riviera but it was caught in large numbers in the Park of Croix des Gardes at Cannes and in the Park of Paradou at Vallauris. Since no traps were deployed at all these sites during the previous years, it could not be ascertained if these captures corresponded to an expansion from the already invaded areas or if the beetles were already present but undetected. Both beetles were still trapped in numbers in the core sites of Ile Ste Marguerite and Bois de la Garoupe but since the first, usually outbreaking, generation of beetles has been missed, it was impossible to compare the population densities between 2019 and 2020 and appreciate the population dynamics.



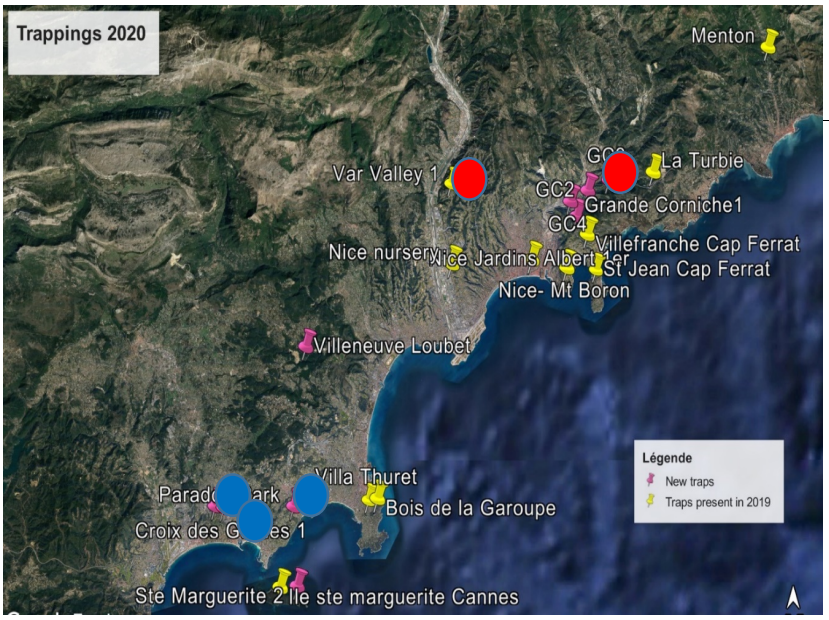


Figure 1: Captures of Xylosandrus compactus and X. crassiusculus by the trapping network deployed in 2020 in the core area. Left: location of the Corniches la Riviera park; Right: Location of the traps and new occurrence of X. crassiusculus (red circles) *and X.* compactus (blue circles).

Discussions in February 2021 with park managers and with associated partners of the core area (cities of Antibes, Cannes, Nice and Conseil Départemental des Alpes Maritimes) led to decide the following modifications of the trapping network for the 2021 beetle monitoring:

- Extend the geographic coverage of the Corniches de la Riviera Park on the north towards the Col d'Eze and towards Vésubie
- Maintain the trappings in the core areas of Nice-Mont Boron, Antibes (Bois de la Garoupe) and Ile Ste Marguerite
- Maintain the trappings in close-by Parks of Paradou and Croix des Gardes, close to Ile Ste Marguerite and include the Park of Estérel, also managed by Departmental Council
- Extend the trappings to nurseries (Antibes, Nice), botanical garden (Menton), large private gardens (Mandelieu, Villefranche/mer) and vegetal recycling center (Antibes)

Finally, **a total of 23 sites for 47 traps will be surveyed** (19 sites in 2020).

2. Modification of the trapping protocol

The trapping 2021 protocol will be similar as the one for 2020, and based on black multifunnel traps baited with quercivorol (1ml) + a-copaene (2 ml)+ Ethanol + (-) a-pinene. The exact design is shown in Figures 2-3.

Quercivorol and a-copaene are obtained as bubble cups (Figure 2) from Synergy Semiochemicals Corp. (Burnaby, BC, Canada) whereas Ethanol UHR (100ml with 96 % purity; release rate 2 g/day at 20°C) and (-) a-pinene (25 ml with 98 % purity; release rate 0.3 g/day at 20°C) are obtained as diffuser packs (Figure 3) from Econex (Spain). Although expected by the suppliers to last 60 days, pragmatic observations led to consider that the efficacy of these doses disappear long before under the Mediterranean climate during summer. **Thus, all of these doses are to be replaced after 6 weeks.**

The **position of the doses** must be as follows: the pack of ethanol is placed tied to the middle of the trap (Figure 3) and the bubbles of quercivorol and a-copaene as well the pack of a-pinene are tied to the 2nd funnel from the bottom.

Figure 2- from left to right: bubble of Quercivorol or a-copaene, pack of Ethanol, pack of a-pinene

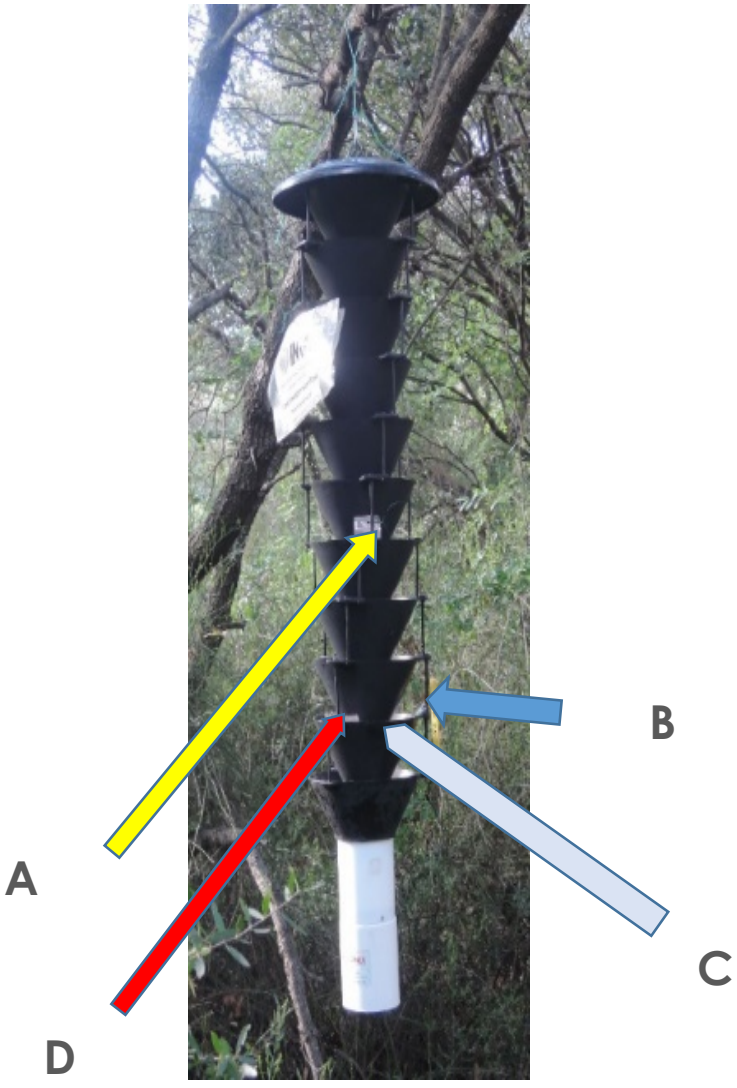


Figure 3: Trapping design to be used in 2020

The trap is hung using a rope at about 3m high on a carob tree or other broadleaved tree. An insecticide net is placed at the bottom of the collector.

The insects have to be collected every 3 weeks.

Taking into account the problems occurred in 2020, specific arrangements have been adopted during the Feburary 2021 meeting in Antibes in order to guarantee the **beginning of the trappings by early April**, and thus allowing a reliable comparison of the numbers of trapped beetles between 2019 and 2021.

3- Control methods

3.1. Mass trapping:

A massive attack of plane trees by *X. compactus*, with damage on trunk and branches, has been observed in 2020 on trees planted around several public squares in the cities of Juan les Pins and Antibes. One of these sites (Vilmorin square in Juan Les Pins) will be used for a tentative mass trapping experiment. The square, ca 50m x 100m hosts 12 plane trees around its limits. At each corner of the square, a trap baited with the 4-component combination will be hung on a plane tree for a total of 4 traps on the square. The trapped insects will be checked every 3 weeks and the shoot infestation on the lower vegetation (oleander, rose and other sensitive shrubs for beetle damage) will be recorded. A nearby square, also attacked by the insect, will be used a control

3.2. Push and Pull

Push and pull" experiments using the repellent compound verbenone will be carried out at Villa Thuret and Ile Sainte Marguerite, with the following protocol:

- Selection on the edge of the forest or park of 4 square blocks of 20m x 20m with confirmed presence of *Xylosandrus* spp.
- Leave a buffer row of at least 20 m between successive blocks. Estimate early March (before the first emergence of females) the previous extent of damage by selecting 10 trees at random per block per zigzag step.
- On each tree, count the exit holes and note their diameter and other visible damage on the trunk, on 10 branches and on 10 shoots from last year.

- Immediately after estimating the damage (i.e. end of February-beginning of March), define the experimental plan using verbenone as a repellent and the combination of the 4 attractive components (ethanol, a-pinene, quercivorol, a- copaene) as attractant (and insecticide in the collector). The following 4 blocks will be defined (Figure 4):
    - *Block 1- Push-pull*: a dose of Verbenone in the center of the block stapled on a trunk and 3 traps baited with the attractants at the periphery of the block
    - *Block 2- Control*: no repellents, no push attractants (V)
    - *Block 3- Pull - Trapping efficiency test*: 3 traps baited with attractants on the periphery of the block, no verbenone
    - *Block 4 –Push- Repellent efficacy test:* a dose of Verbenone in the center of the block stapled to a trunk, and no attractant at the periphery

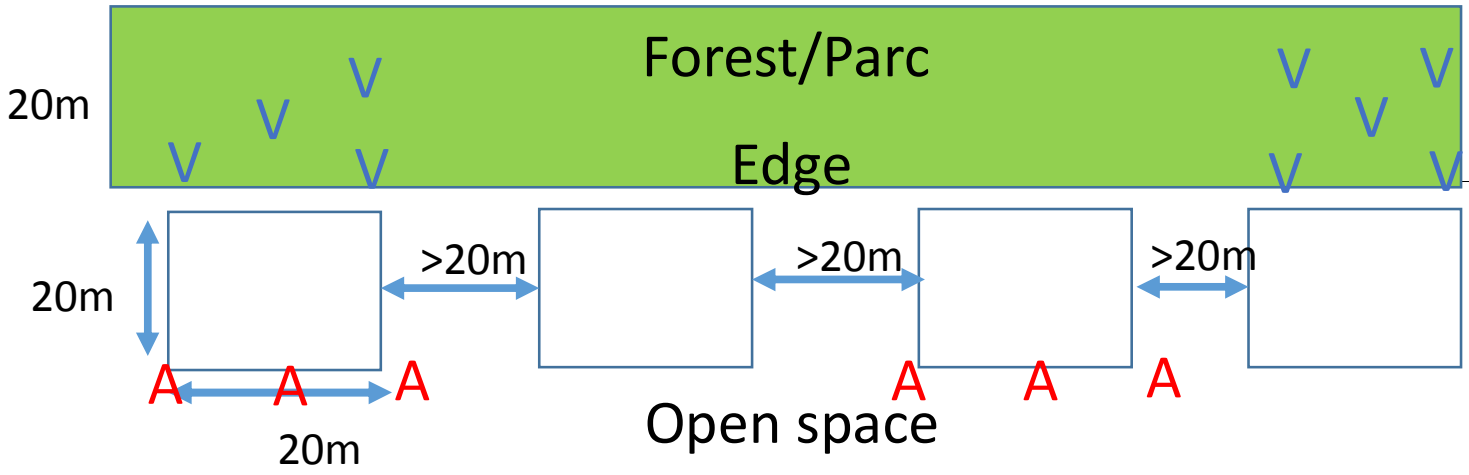


Figure 4: design of the push and pull experiments

- Data collection:

Collect the insects from the traps in blocks 1 and 3 every 3 weeks and change the insecticide until the end of July (first dispersal flight supposed to be over) and send to INRAE - 7 checks

- Change of products: Change repellents and attractants every 6 weeks (i.e. 4 doses per trap / repellant) in blocks 1, 3, 4. End of experiment end of July

- Estimated Push & Pull Effect: In the 4 blocks, select by late July 10 plants per block using a random zig-zag walk. On each plant, count the exit holes, their diameter and other visible damage on the trunk, on 10 branches and on 10 apical shoots of approx. 50 cm long

4- Conclusions

We hope that the development of the Covid-19 crisis will not delay again all these planned experiments and surveys 2021.