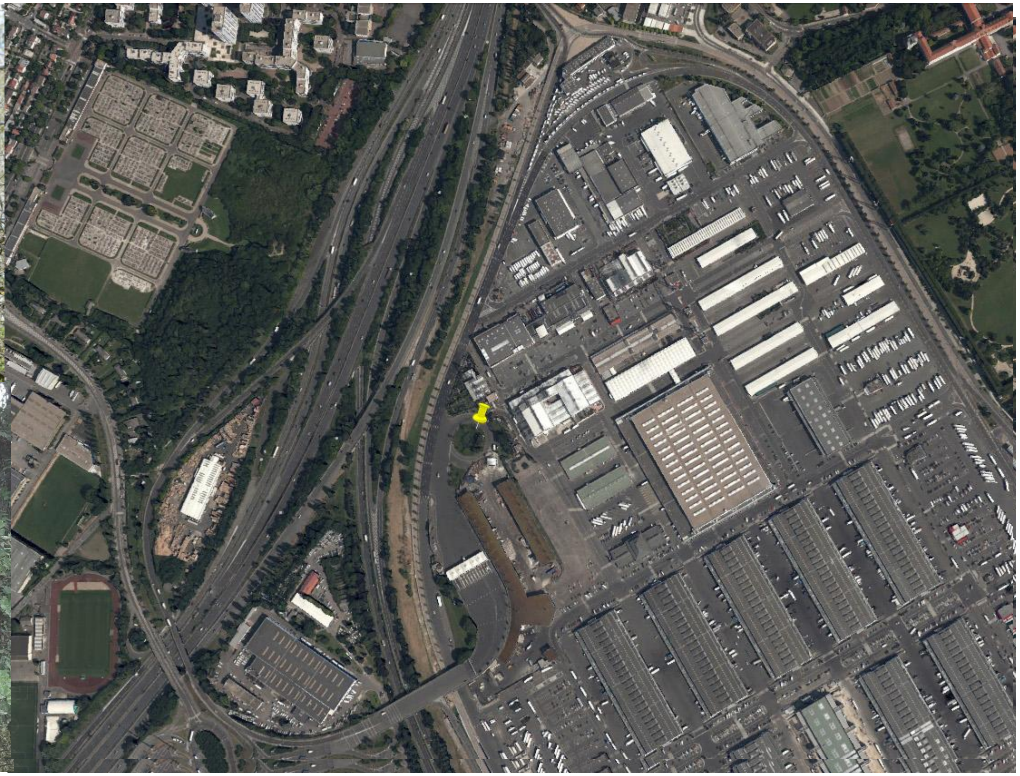
MULTITRAP-EU EUPHRESCO

PORTRAP-FRANCE

Testing a compromise trapping design to capture both non-native species of long-horned beetles and *Agrilus* spp.



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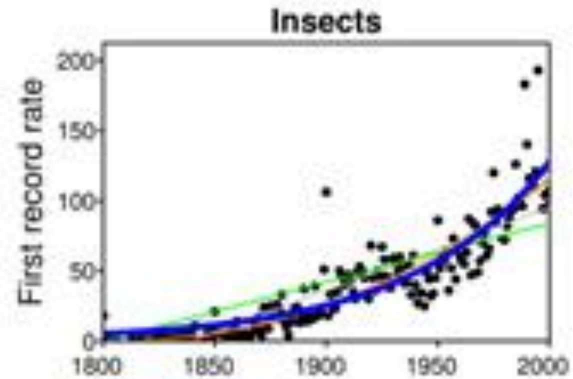
PREPSYS- Preparing Europe for invasion by the beetles emerald ash borer and bronze birch borer, two major tree-killing pests Vienna, 1-4 October 2018

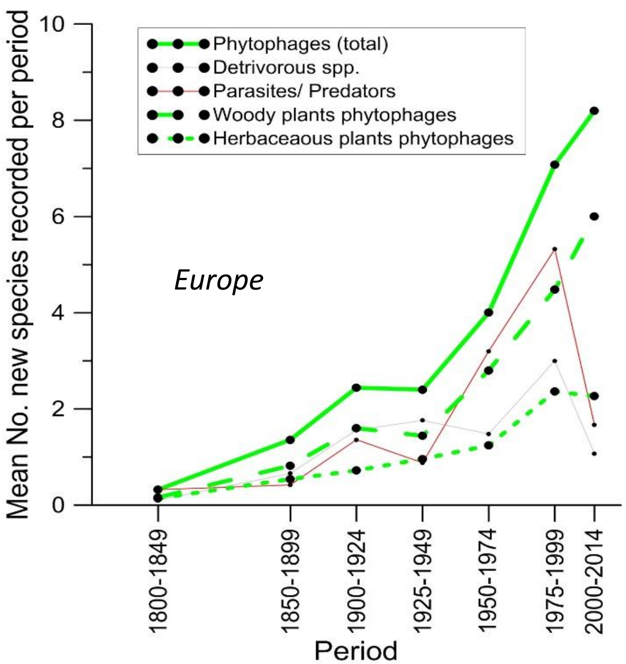
Facing a constant increase in arrivals of exotic xylophagous species

No saturation at all in arrival of exotic insects all over the world



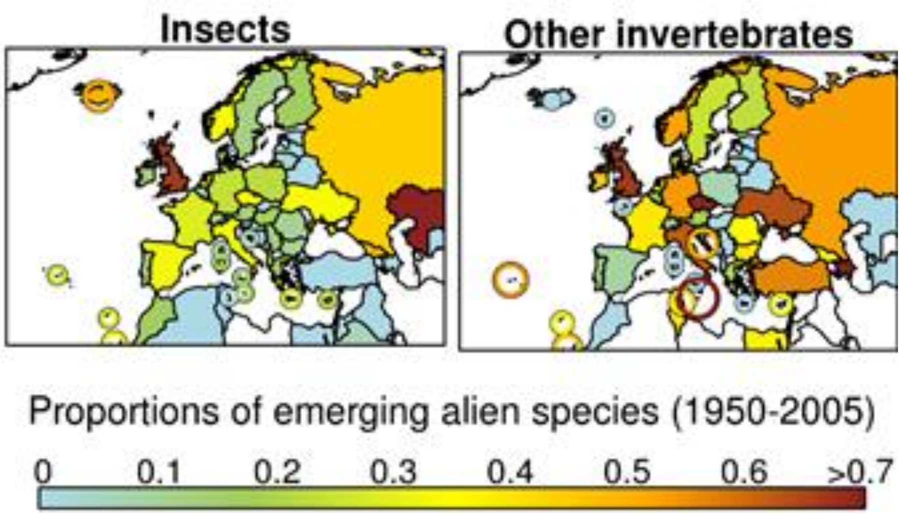
(Seebens et al., Nat.Comm. 2017)

Increase mainly due to species associated to woody plants unlike those related to herbaceaous or to other feeding groups



(Roques et al., Biol. Inv. 2016)

An increasing proportion of « emerging » species



(Seebens et al., PNAS 2018)

Early detection at arrival, a major challenge !

Phytosanitary inspection, yes… but facing trade increase, a need for more automated tools !

- ❑ Settle multiple traps baited with a single, specific lure for a given targeted species … *high manpower and costs and most arriving species remain unknown*

vs.

- ❑ Settle a few traps with a multicomponent lure expected for a generic effect on families, subfamilies, tribes or genera … *limited costs and unknown arriving species may be trapped*

Implies to check possible repellency effects between components of the multilures through tests in forests, statistical treatments being not possible in ports-of entry

Which lures expected for generic attractivity in cerambycids ?

Lures to be tested were defined according to previous works in North America and China (Hanks et al., 2012; Wong et al., 2012; Wickham et al., 2014; Sweeney, 2015; synthesis by Hanks and Millar, 2016 about sex and aggregation-sex pheromones in Cerambycids).

Compound	Sex	Subfamily	Tribe
Fuscumol + Fuscumol Acetate *(50mg/ml+ 50mg/ml)*	M	Aseminae Lamiinae	Asemini Acanthocini Acanthoderini Obriini
Geranyl acetone *(25mg/ml)*	M	Aseminae Lamiinae	Asemini Acanthocini
Monochamol *(50mg/ml)*	M	Lamiinae	Laminii Monochamiini
3-hydroxyhexan-2-one (C6-ketol) *(50mg/ml)*	M	Cerambycinae	Callidiini Clytini Hesperophanini Hylotrupini Molorchini
Prionic acid *(0,5 mg/ml)*	F	Prioninae	Prionini
2-methylbutanol *(50mg/ml)*	M	Cerambycinae	Callidiini
2R*,3S*-hexanediol *(50mg/ml)*	M	Cerambycinae	Clytini

Successive experiments during 2014- 2016 with increasing combinations (1, 2, 4, 8 compounds) finally led to select a 8-component blend, complemented with α-pinene and Ethanol (Fan et al, *J. Pest Science* 2018)

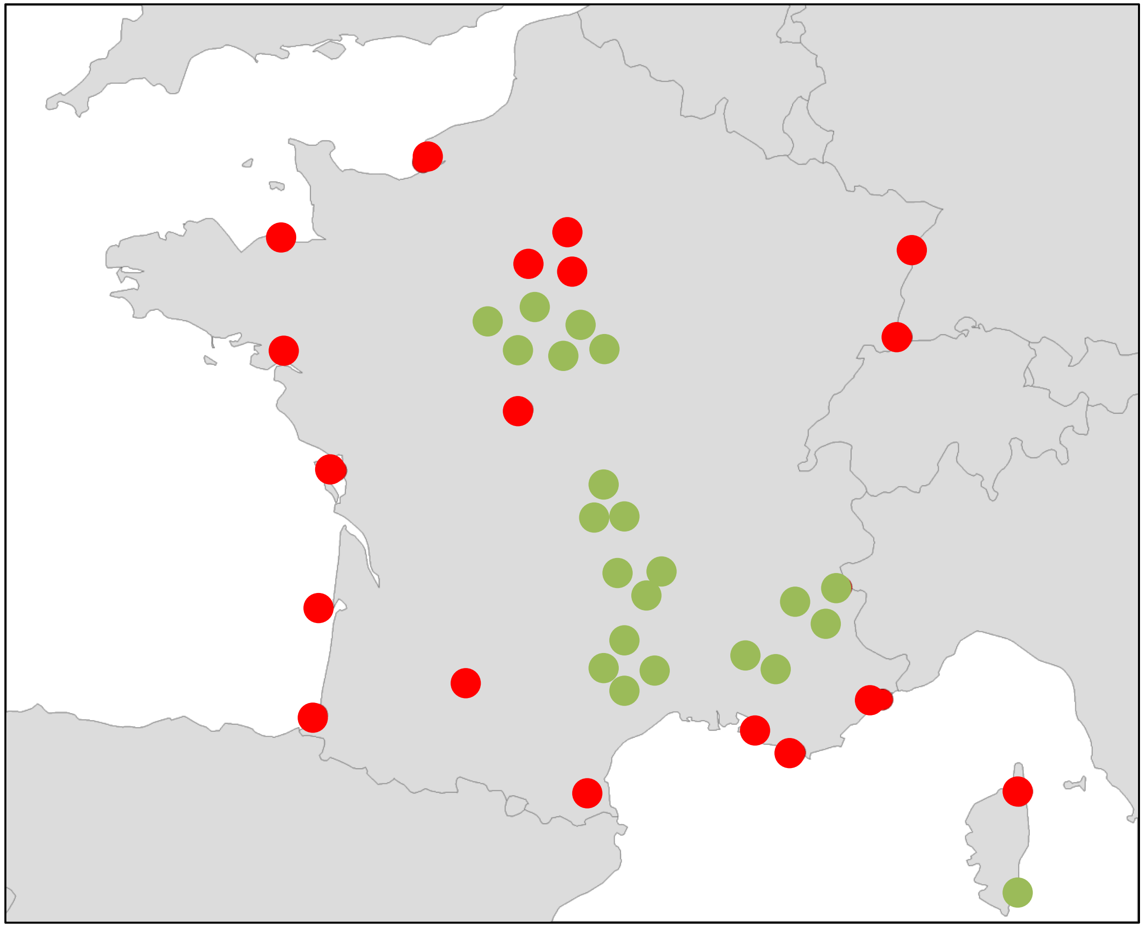
8-component pheromone blend diluted in isopropanol

2017 trapping design for cerambycids



- Black traps, either cross-vane or multifunnel
- Coated with teflon
- A grid for water at collector's bottom
  and insecticide net (for DNA barcoding)
- Attractants on impregnated dental cottons in polyethylene zip bags:
  - 1ml of 8- component blend at the middle
  - 2ml of α-pinene at basis above collector
  - 5 ml of EtOH at basis above collector
- Attractants changed every 3 weeks
- Traps rotated clockwise when attractants changed

2017 Trapping places

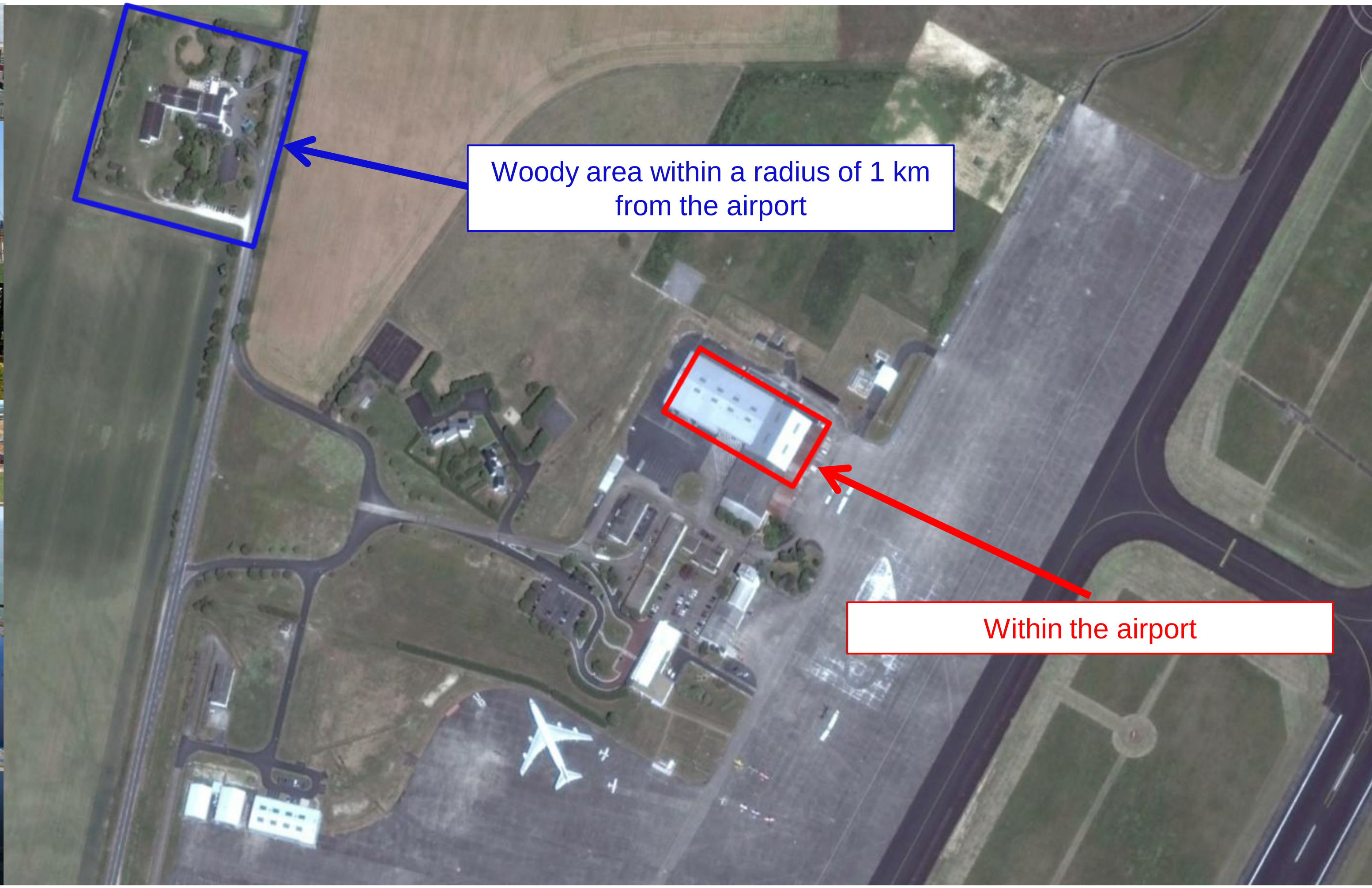


- Forests
  3 replicates of each multilure per site

- Ports of entry (maritime, fluvial, aiport, national market)
  4 replicates of each multilure per site:
  - *2 within the port*
  - *2 within a 1 km radius*

Whenever possible near wood waste deposit areas
(Rassati et al., 2014)

An example at Chateauroux airport



Trappings 2017 with black traps baited with 8-component blend

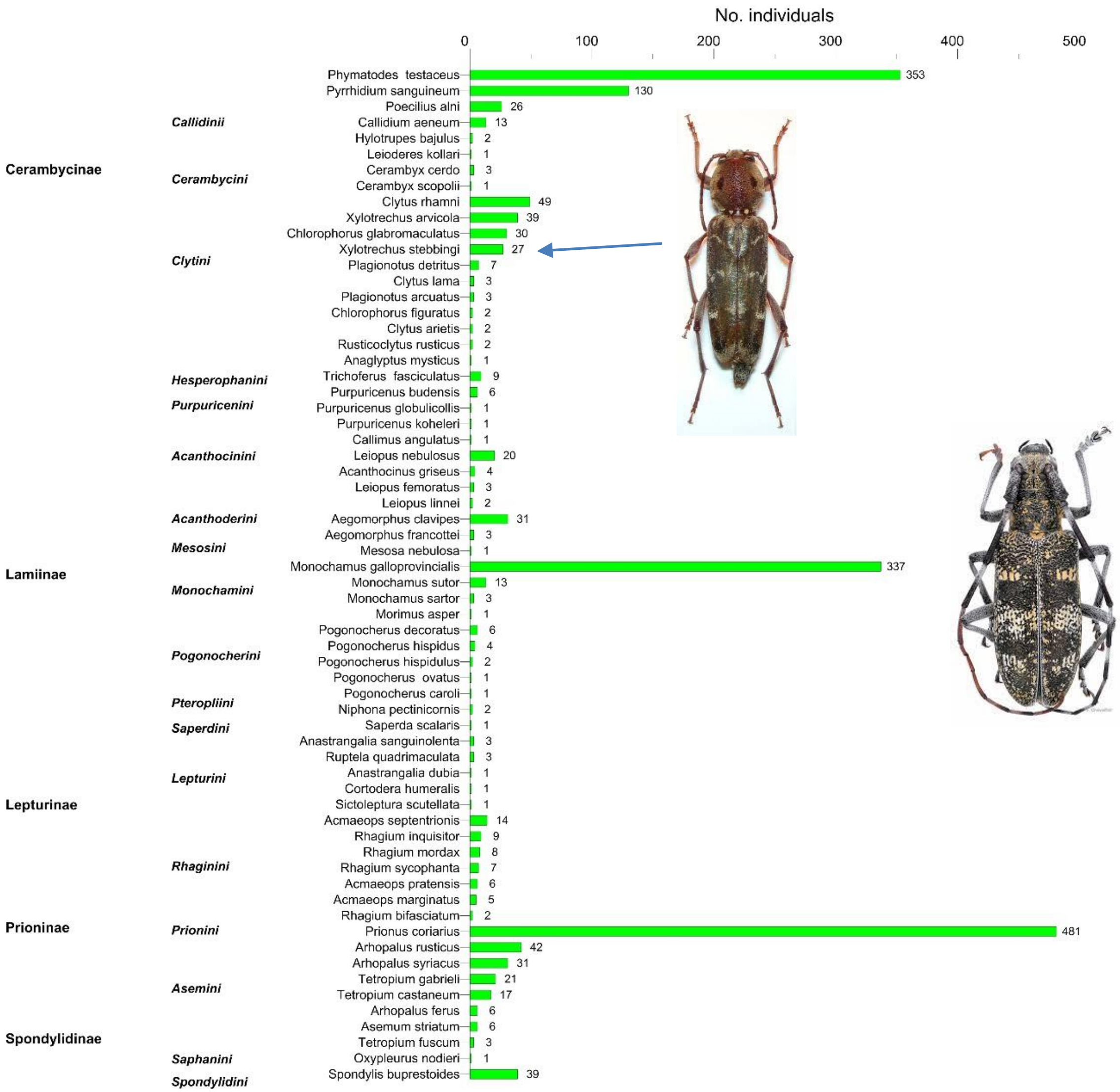
No. Individuals / Type site	Cerambycidae	Buprestidae	Curculionidae s.s.	Scolytinae	Cleridae
Inside Port	358	4	41	155	30
Outside Port	829	8	50	350	37
Forests	1854	95	580	1092	1627
Total	3041	107	671	1597	1694

No. species / Type site	Cerambycidae	Buprestidae	Curculionidae s.s.	Scolytinae	Cleridae
Inside Port	21	4	19	35	2
Outside Port	27	10	22	42	2
Forests	64	20	51	55	7
Total	82	24	70	62	7

Same results during the preceding years :

- **No significant differences between cross vane vs. multifunnel traps**
- **Few buprestids trapped vs. good coverage for other xylophages**

2017 Results in forests:
a good genericity for long-horned beetles



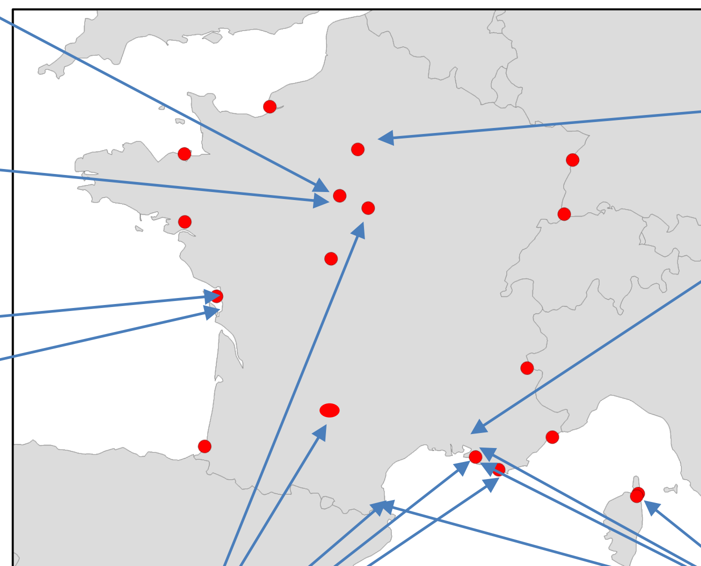
64 spp. from 5 subfamilies and 18 tribes including 1 exotic *Xylotrechus stebbingi*

Only 21 species of cerambycids trapped inside ports- of entry … but

- **4 exotic cerambycid species** of which 2 new records for Europe
- **2 exotic platypodid and ambrosia beetle** plus palm weevils
- **PWN vector within CDG airport and Fos port**

Xylotrechus altaicus
Larix East Asia

Uraecha angusta
Camphor tree China



Monochamus galloprovincialis

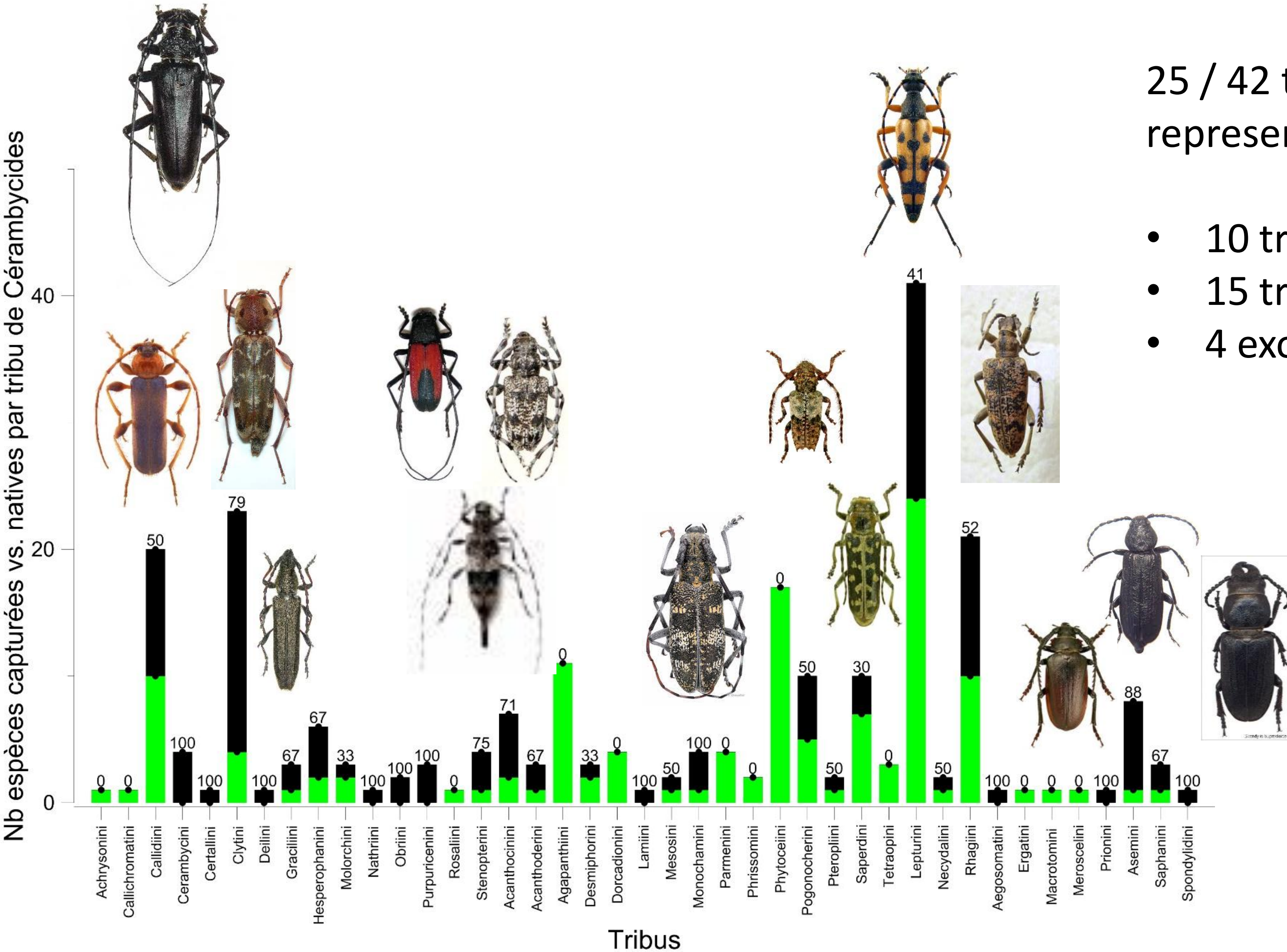
Xyleborus affinis
Euplatypus parallelus

Xylotrechus stebbingi-
Broadleaved- China

Rhynchophorus ferrugineus

Cerambycid fauna trapped since 2014 vs. native fauna

114 spp. trapped = 47.9% of the French fauna!



25 / 42 tribes well represented:

- 10 tribes at 100%
- 15 tribes > 50%
- 4 exotic species

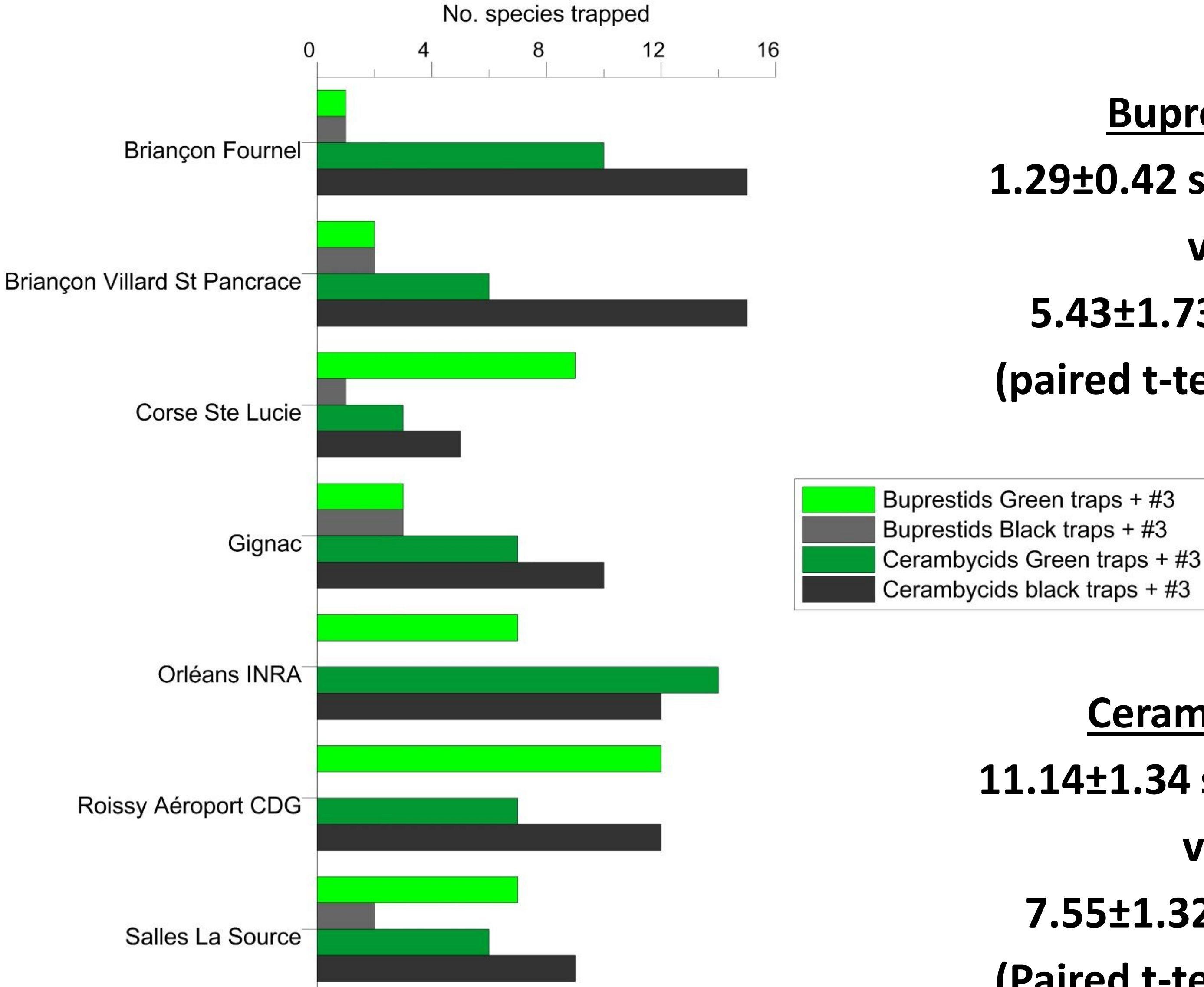
Are green traps baited with the 8-component blend capable of trapping buprestids without minimizing cerambycid captures?

The attractiveness of green multifunnel traps was compared to that of black multifunnel traps in 6 forests located in different ecosystems (North, Central, South, Corsica, Alps) and 1 airport (CDG) in 2017

Both traps baited with the 8-component blend

Significantly more buprestid species on green vs. black

Significantly less cerambycid species on green vs. black



<u>Buprestids</u>

1.29±0.42 spp. on black

vs.

5.43±1.73 on green

(paired t-test; P= 0.01)

<u>Cerambycids</u>

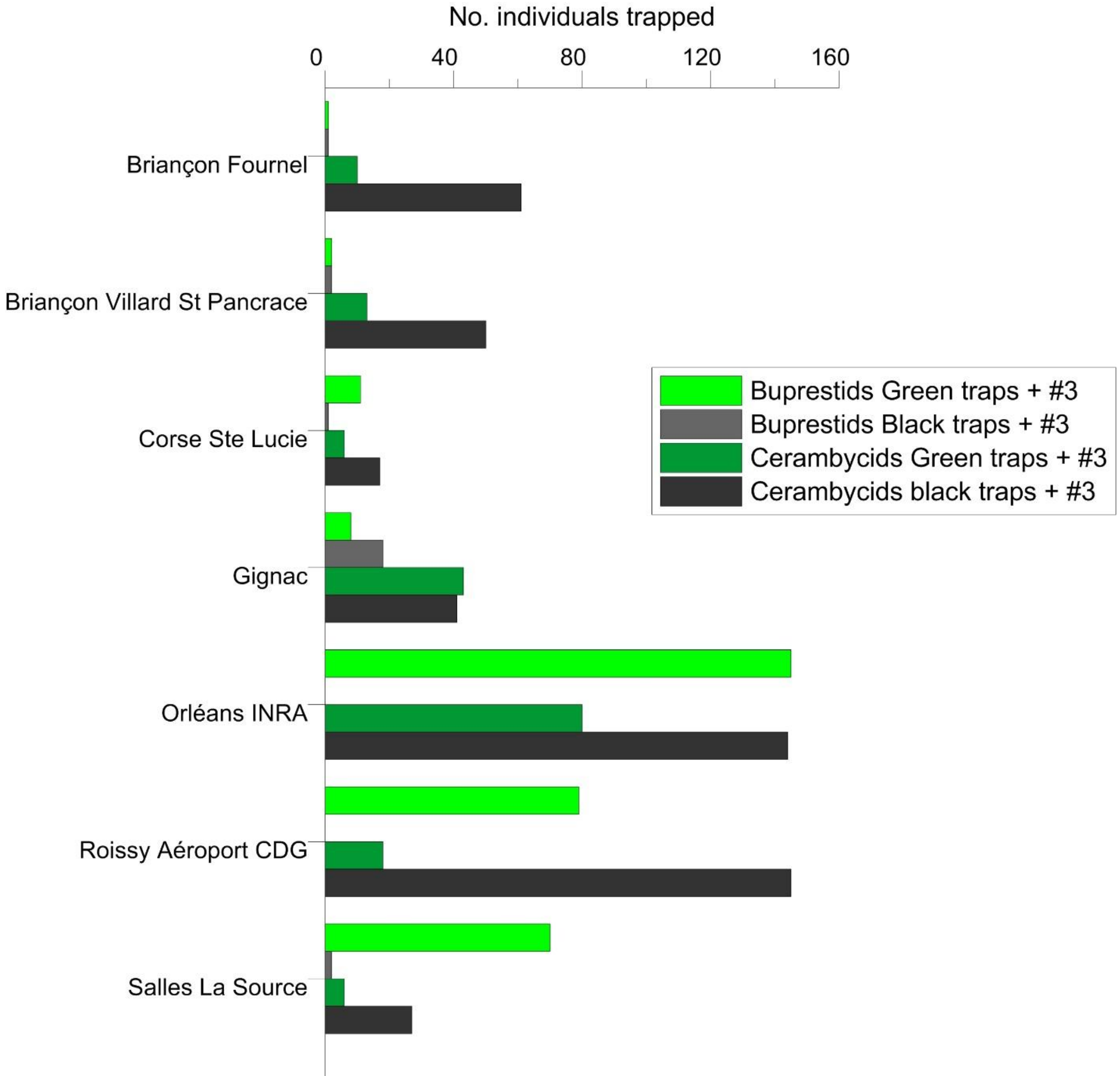
11.14±1.34 spp on black

vs.

7.55±1.32 on green

(Paired t-test; P= 0.03)

Same results for the number of trapped individuals



Buprestids

3.43±2.45 spp. on black

vs.

45.14±20.75 on green

(paired t-test; P= 0.02)

Cerambycids

69.29±20.16 spp on black

vs.

25.14±10.34 on green

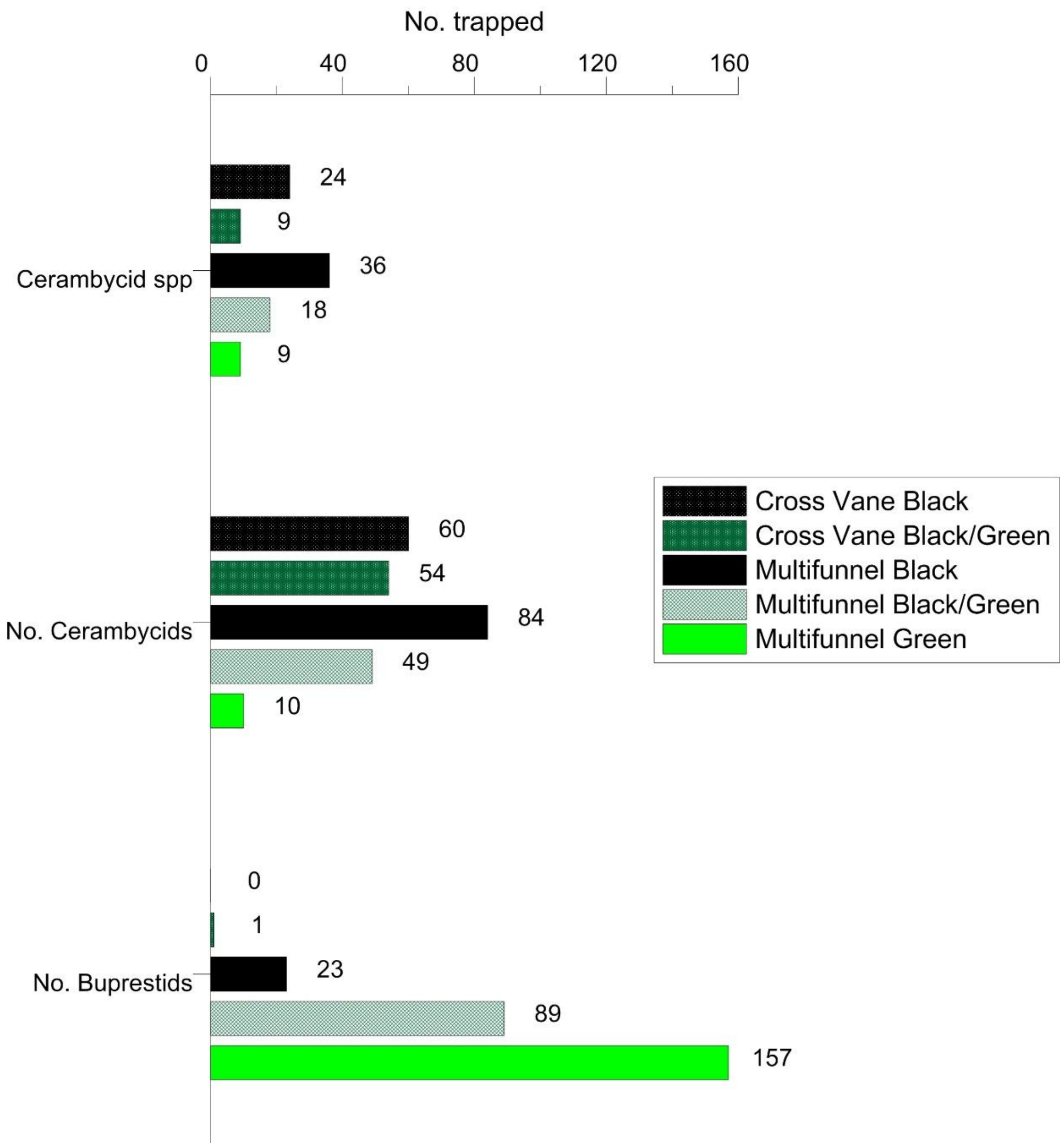
(Paired t-test; P= 0.03)

Tests 2018
Is a combination green-black baited with the 8-component blend a good compromise in order to trap both buprestids and cerambycids ?

Attractiveness of black/green multifunnel and cross-vane traps tested with regard to that of black and green traps baited with the same compound

The same 6 sites as in 2017 plus one site in south-eastern France (Var)

Very preliminary results on 17 lots (site*3 week-period) over 49



- The combination black/green is apparently not a good compromise:
  - less buprestids than in green traps
  - less cerambycids than in black traps.
- Multifunnel black/ green may be more effective than cross-vane black/green
- To be confirmed when all lots analyzed

Conclusions

- The 8-component blend (eventually added with other cerambycid pheromones) associated to Ethanol and (-) α-pinene is effective to trap species of most tribes of Cerambycids and bark and ambrosia beetles but not most buprestids if the trap is black.

- For the moment, the tested color combinations mixing black and green did not appear to result in efficient trapping of both buprestids and cerambycids. Other color designs, eg. purple and combination, have to be tested. Also traps at different heights in the canopy (although the situation is different in potential ports-of-entry)

- However, it is likely that a single trap baited with generic lures for a large scope trapping of cerambycid and scolytids will not be adapted to the trapping of buprestids in the ports-of-entry and that several traps with different designs and baits will be necessary for early detection.

- Need to keep in mind that traps are only an additional tool: the probability that insects arrive at the adult stage or near adult stage in ports-of entry is low ! Settling traps in wood waste deposit areas where larvae may have time to turn to adults may increase the detection success

Acknowledgements

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Thank your for
your attention !