Action C1

Remote sensing data provision and

X-platform management

Deliverable: Report on GIS and local data collection and analysis in GIS framework

Prepared by: Terrasystem s.r.l.

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INDEX:

OVERVIEW: the analysis take advantage of the previous zoning procedures and results, illustrated in the project Milestones named 'Zoning of study areas vegetation in GIS-based environment' and 'Geospatial data ready for zoning support'. The analysis are carried out according to the information available in each study area, adopting a flexible approach to meet users' needs, and exploiting expert knowledge in forest and vegetation ecology, GIS and spatial analysis.

OBJECTIVE: the deliverable reports on field data collection, from surveys and traps, and their analysis carried out in GIS-based environment, and integration in the project database.

METHODOLOGY:

- Analysis of field survey presence/absence data for different *Xylosandrus* species in each of the study areas
- Analysis of trap collected data (species, number) in each of the study areas
- Spatial visualization and analysis in GIS environment
- Update of risk maps in GIS environment

METHODOLOGY DETAILS FOR ITALY:

Two data sources are available for Italy: from a field survey carried out in 2019 by Circeo NP staff, and from traps installed in the same year.

The maps are produced considering a positive record (observation) if the surveyed point or traps included at least one X. species during the season.

Being the first year, multiple records of presence for traps were not considered or weighted in the analysis. The risk map procedure was reviewed according to datasets.

The risk maps are based on a 3 main colors risk legend, and consider the risk of X. expansion/presence according to vegetation type:

1 Higher risk (>10 obs.)
2 Medium risk (6-10 obs.)
3 Lower risk (1-5 obs)
4 Absence of risk

These main classes of the legend are further detailed with color tones, according to:

a - > 6 observations
b - from 1 to 5 observations
c - zero observation but same vegetation class in which records were found

The vegetation classes/units are built according to the procedure detailed in the mentioned Milestones ('Zoning of study areas vegetation in GIS-based environment' and 'Geospatial data ready for zoning support') and are based on Corine Land Cover data (CUS legend) with further stratification performed in the framework of this project and based on slope and aspect data (INT legend).

For Italy, 5 risk maps were generated:

A- Risk_Map_Xylosandrus_Genus: based on all the different X. species and on data from traps and survey points.

B- Risk_Map_Xylosandrus_Compactus: based on X. compactus data only, using both survey and traps data

C- Risk_Map_Xylosandrus_Compactus_TRAPS: based on X. compactus data only, using only traps data

D- Risk_Map_Xylosandrus_Crassiusculus_TRAPS: based on X. crassiusculus data only, using only traps data

E- Risk_Map_Xylosandrus_Germanus_TRAPS: based on X. germanus data only, using only traps data

RESULTS FOR ITALY:

Field survey data:

- 77 observations collected from 21March to 21 September 2019 in NP and replication areas
- 51 points in project area, 34 points positive for X. presence (rate 67%)

Overall field data (on CUS legend)

XYLOSANDRUS GENUS (all species, surveys and traps data)		
Class	**Description**	**# obs**
141	Verde Urbano	1
2121	Seminativi in aree irrigue	1
31211	Pinete artificiali a pino domestico e/o pino marittimo	7
32113	Praterie pseudo-steppiche ad Ampelodesmos mauritanicus e/o a Hyparrhenia hirta	5
32322	Macchia a ginepro fenicio delle coste alte, con euforbia arborescente e/o palma nana	1
32323	Macchia a mirto e lentisco o a olivastro e lentisco	1
32324	Garighe a cisti, erica e rosmarino o ad Helichrysum litoreum	1
311111	Leccete termomediterranee costiere	28
311213	Cerrete con farnetto	16

XYLOSANDRUS COMPACTUS (surveys + traps)		
Class	**Description**	**# obs**
141	Verde Urbano	1
2121	Seminativi in aree irrigue	1
31211	Pinete artificiali a pino domestico e/o pino marittimo	7
32113	Praterie pseudo-steppiche ad Ampelodesmos mauritanicus e/o a Hyparrhenia hirta	5
32322	Macchia a ginepro fenicio delle coste alte, con euforbia arborescente e/o palma nana	1
32323	Macchia a mirto e lentisco o a olivastro e lentisco	1
32324	Garighe a cisti, erica e rosmarino o ad Helichrysum litoreum	1
311111	Leccete termomediterranee costiere	28
311213	Cerrete con farnetto	10

XYLOSANDRUS COMPACTUS (tras)		
Class	**Description**	**# obs**
311111	Leccete termomediterranee costiere	15
311213	Cerrete con farnetto	7

XYLOSANDRUS CRASSIUSCULUS (traps)		
Class	**Description**	**# obs**
311111	Leccete termomediterranee costiere	1
311213	Cerrete con farnetto	7

XYLOSANDRUS GERMANUS (traps)		
Class	**Description**	**# obs**
311111	Leccete termomediterranee costiere	11
311213	Cerrete con farnetto	12

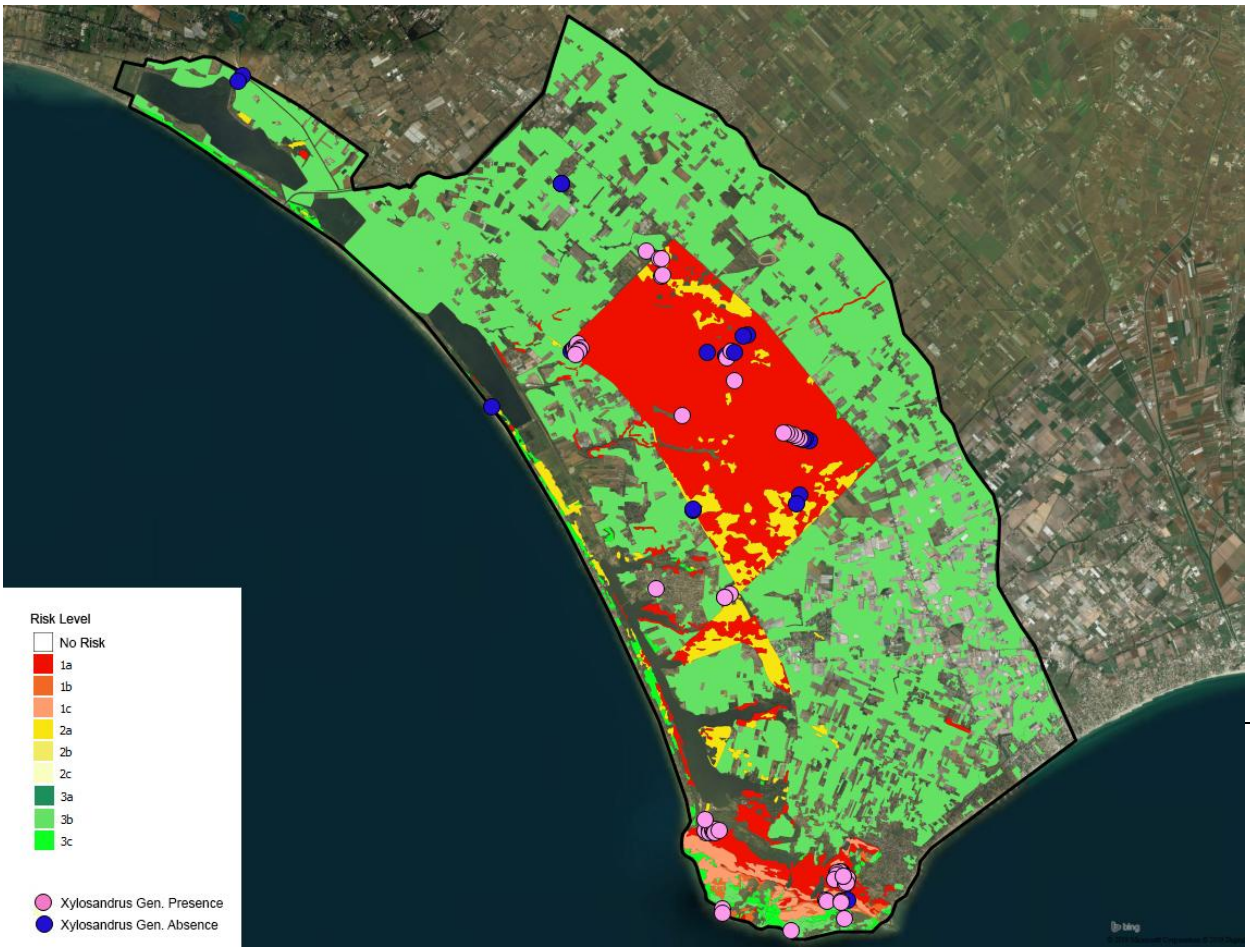
Overall the traps data, and the derived risk maps (below) indicate the following:

- Importance of survey data, that allow to better understand the spatial distribution of X. genus presence on the study area, for having a wider distribution on the territory than the traps data. However traps data allow to derive important information on the different species. Therefore both monitoring efforts are needed for surveillance and early warning purposes
- X. genus seems to prefer, in order, vegetation types with dominance of Quercus ilex, Quercus cerris, Pines spp., and dry prairies.
- X. compactus is the dominant species in the area and with wider vegetation type preference
- X. crassiusculus presence seems mainly restricted to vegetation dominanted by Quercus cerris
- X. germanus was observed in Quercus dominated vegetation
- It is interesting to note that outside the Circeo mainland NP a record was found in the Zannone island: this is a very interesting data for understanding drivers of spread and early warning planning.

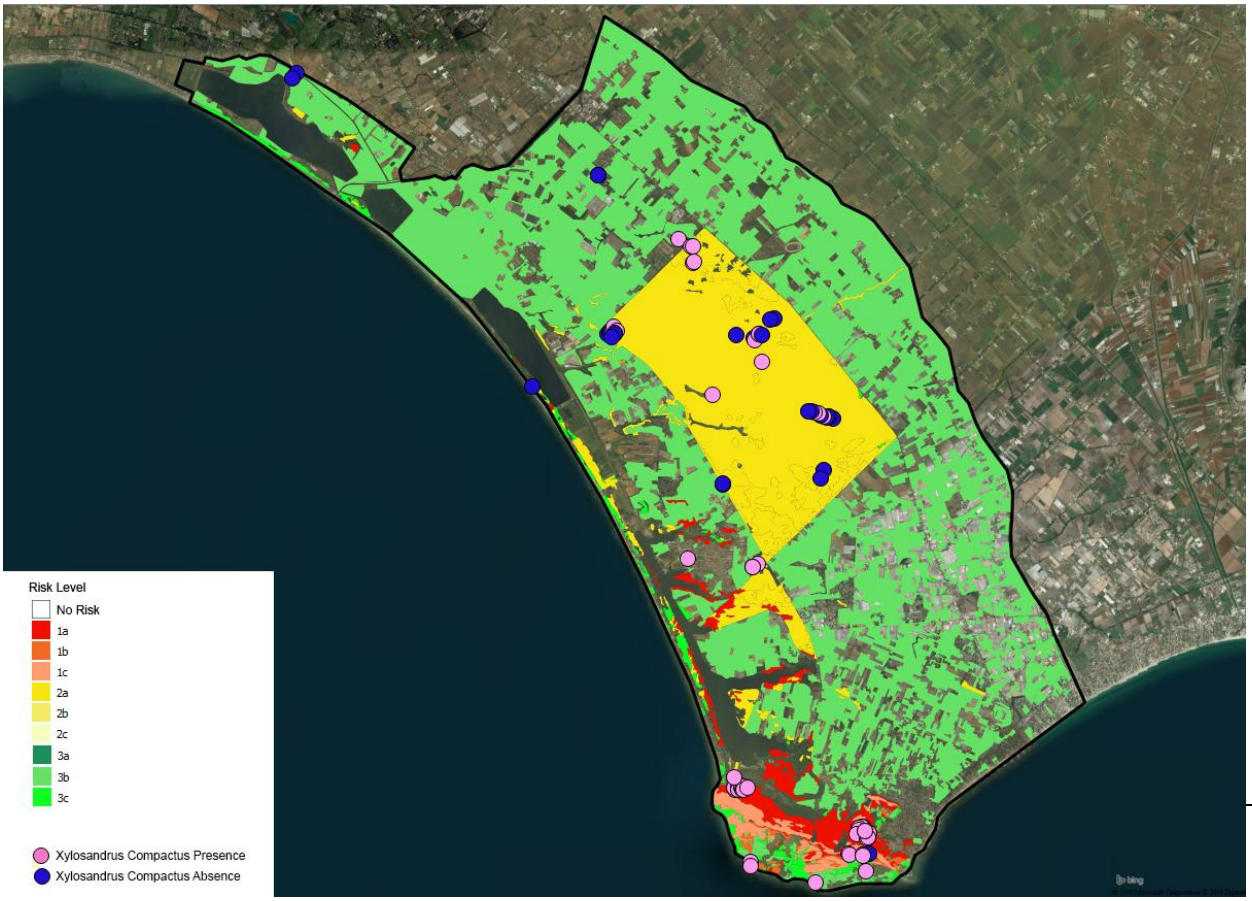
Being the first year, the risk maps have limited value: with further field data from future sampling efforts, it will be possible to better differentiate risks according to species and vegetation types. The results are very encouraging as they provide first insights on risks associated to specific vegetation species, and the distribution of the three species of X.

Risk maps:

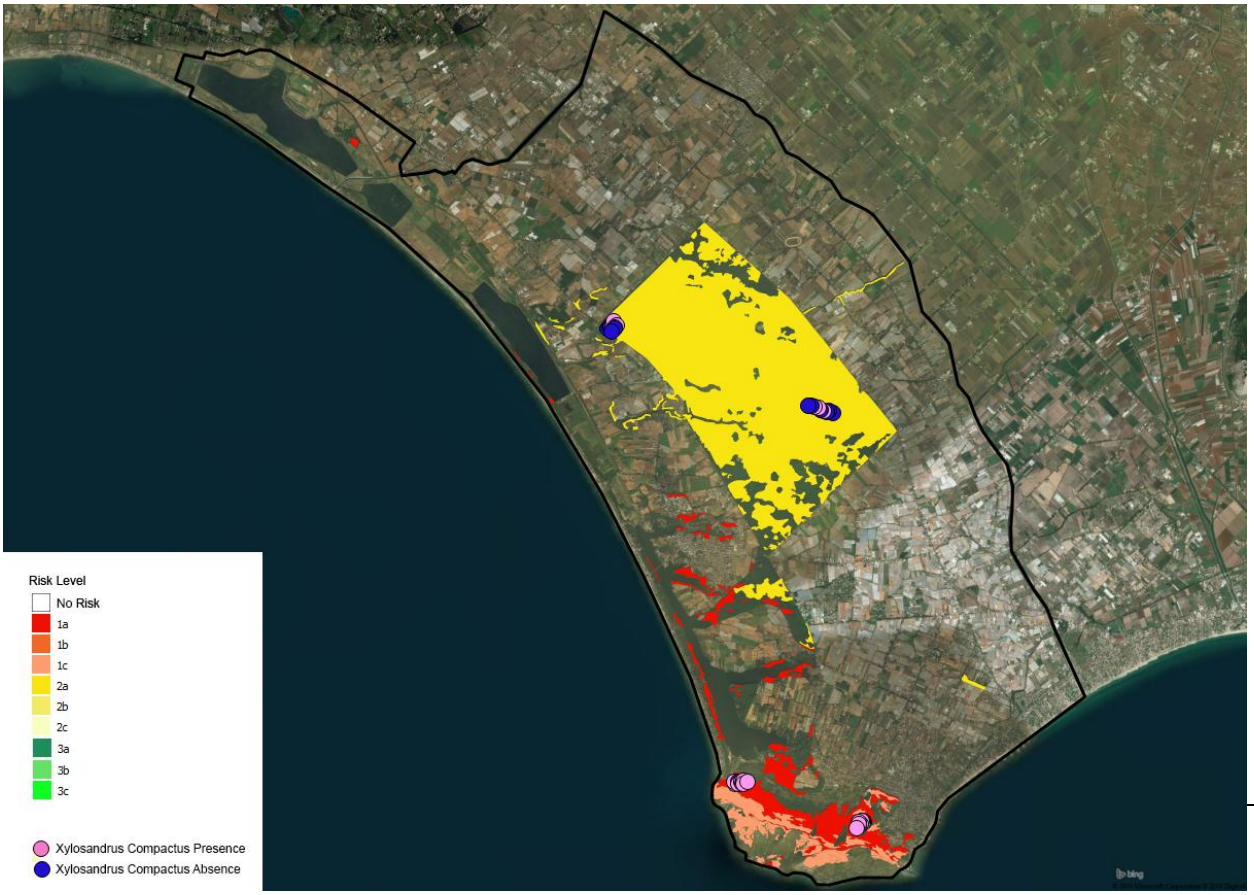
A- Risk_Map_Xylosandrus_Genus: based on all the different X. species and on data from traps and survey points.



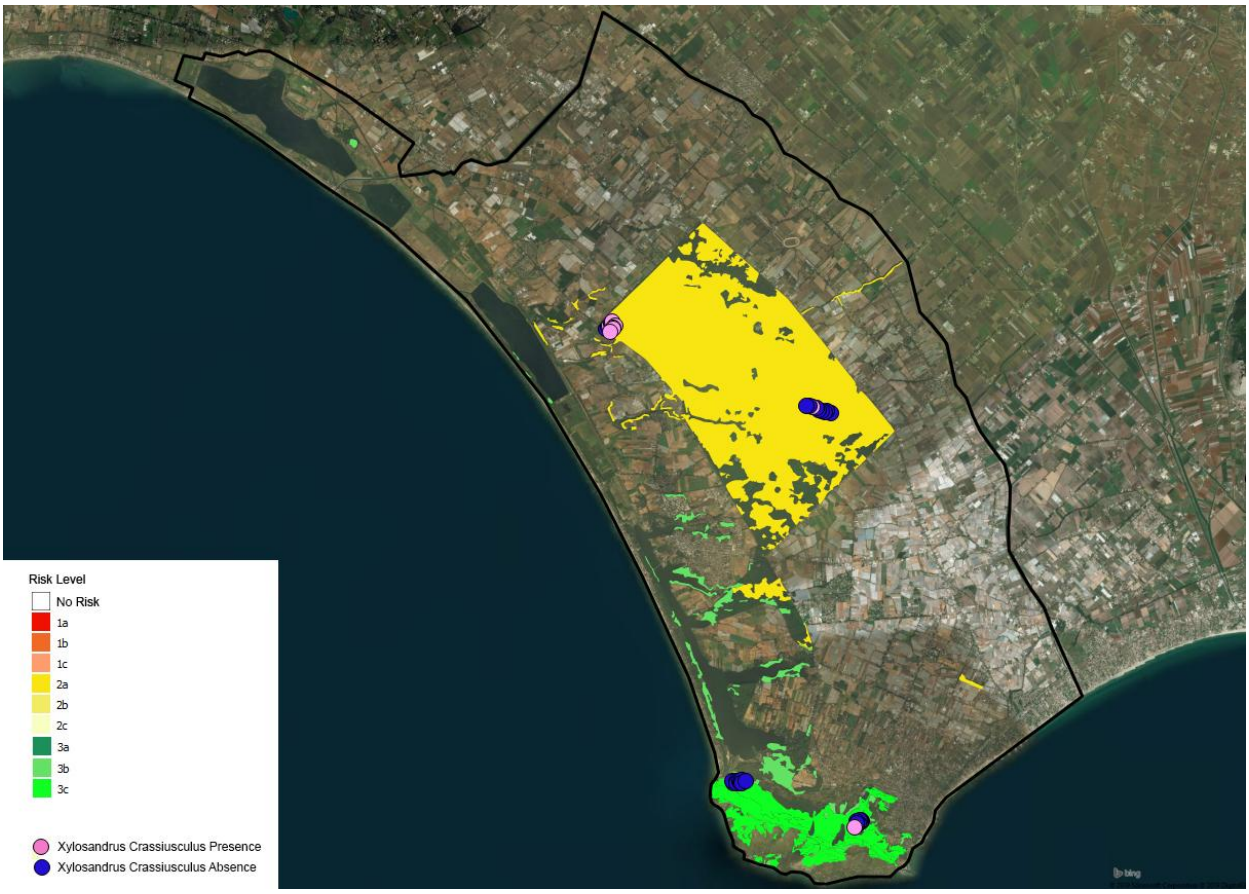
B- Risk_Map_Xylosandrus_Compactus: based on X. compactus data only, using both survey and traps data



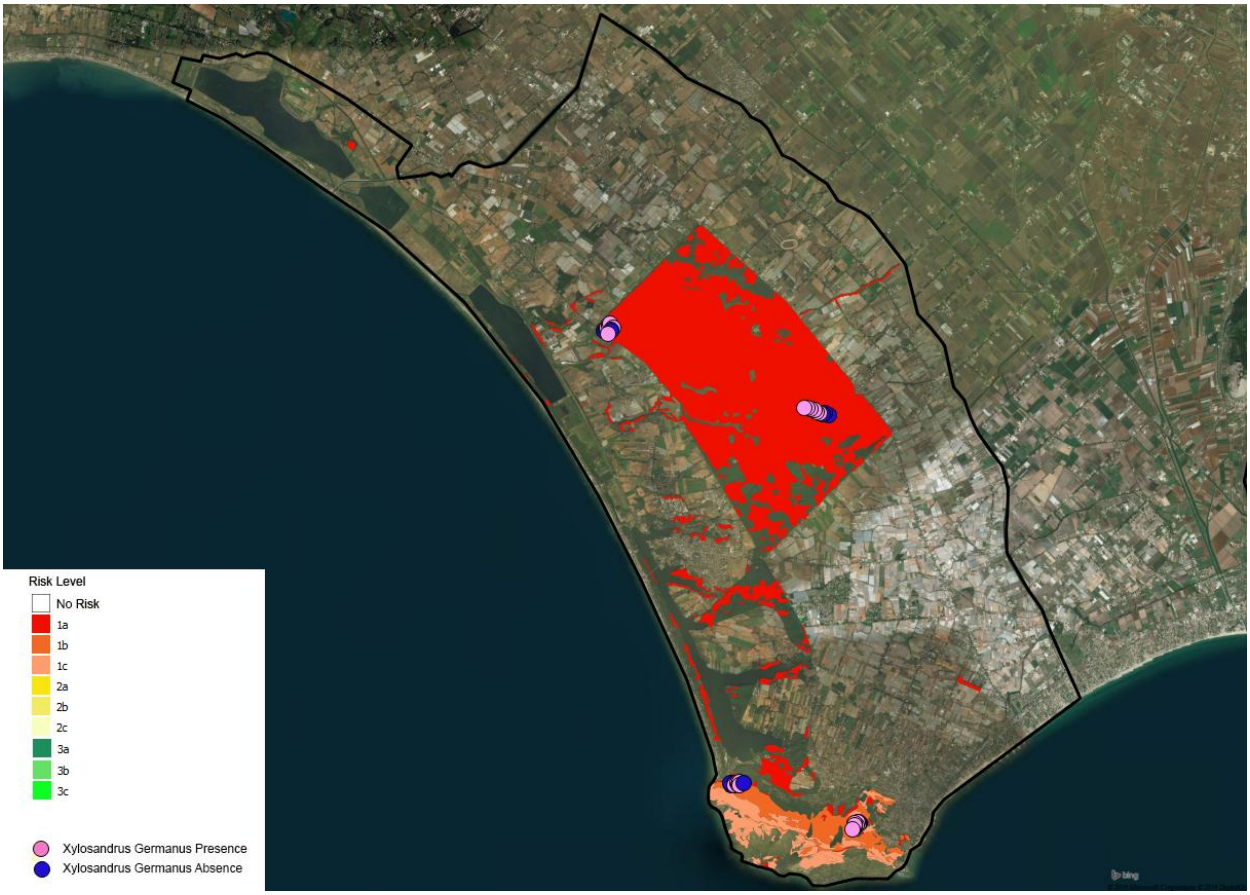
C- Risk_Map_Xylosandrus_Compactus_TRAPS: based on X. compactus data only, using only traps data



D- Risk_Map_Xylosandrus_Crassiusculus_TRAPS: based on X. crassiusculus data only, using only traps data



E- Risk_Map_Xylosandrus_Germanus_TRAPS: based on X. germanus data only, using only traps data



METHODOLOGY DETAILS FOR FRANCE:

In France, the flexible Samfix approach made possible to meet the strong requirement by local partners and institutions (forest service, agriculture dept., local municipalities) to better understand the expansion dynamics and associated risks all along the coastal line, and not only in planned project and replication areas.

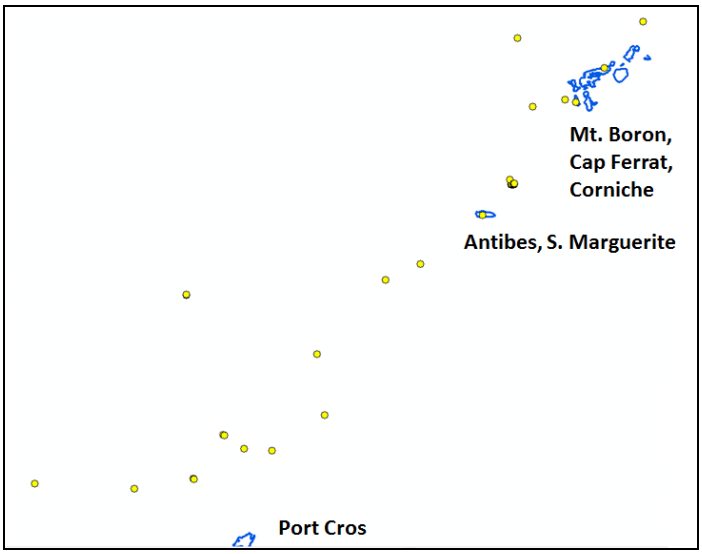
This implied an adjustment of the strategy, initially based on the zonification of the smaller project areas based on land cover and vegetation type data, to consider the features and the data over a much larger area.

Therefore, the analysis of the coast implied the aggregation of main land cover classes from Corine Land Cover data, to focus on the main cover types, including: forests, burnt areas, residential areas, maquis, urban and commercial/industrial areas.

Only traps data were collected during 2019.

RESULTS FOR FRANCE:

The following figure illustrates the trapping effort distributed all along the French coast.



In total, 13 traps resulted to be positive -during the sampling period- to X. presence.

The distribution of X. genus in different vegetation types, according to CLC legend, resulted as follows:

CLC2018 class	# obs	Class definition
311	1	Broadleave forest
324	1	Forest and maquis in transition
112	2	Sparse residential areas
121	2	Industrial areas
313	2	Mixed broadleave and needleave forest
334	2	Burnt areas
141	3	Green urban areas

The distribution of the X. compactus species resulted as follows:

CLC2018 class	# obs	Class definition
112	1	Sparse residential areas
313	1	Mixed broadleave and needleave forest
334	2	Burnt areas
141	3	Green urban areas

The distribution of the X. crassiusculus species resulted as follows:

CLC2018 class	# obs	Class definition
112	1	Broadleave forest
311	1	Forest and maquis in transition
324	1	Sparse residential areas
121	2	Industrial areas
313	2	Mixed broadleave and needleave forest
141	3	Burnt areas

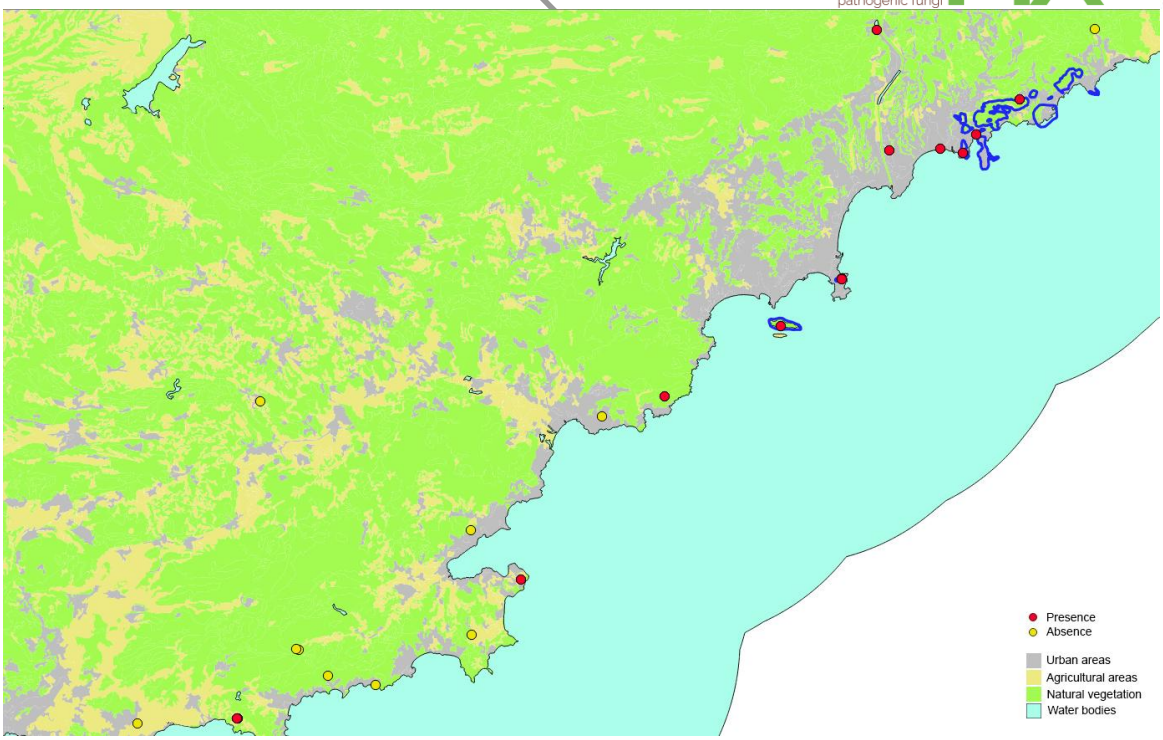
The distribution of the X. germanus species resulted as follows:

CLC2018 class	# obs	Class definition
121	1	Industrial areas
311	1	Broadleave forest
334	1	Burnt areas
112	2	Sparse residential areas
313	2	Mixed broadleave and needleave forest
141	3	Green urban areas

Given the limited number of traps and the absence of field survey data to collect additional presence/absence records, these data from 2019 can only be considered preliminary indications to be confirmed and validated with 2020 data. With respect to the species presence in different vegetation types, the records indicated no preference, differently from Circeo NP in Italy.

However, these spatially extended sampling along the coast allowed to appreciate an expansion of the invasion in new areas.

The following figure illustrate presence/absence of X. genus in the traps along the French coast:



The following figure illustrates the amount of X. specimens (cumulated species records) collected in the different traps, and confirms the likely origin of the occurrence of X. in the area.

METHODOLOGY DETAILS FOR SPAIN:

In El Tello area, the analysis was conducted based on the zoning previously performed and with Corine Land Cover data, but also exploiting an additional layer: the map of the ancient carob tree plantations. In fact, the X. crassiusculus species (the only species originally recorded in the area) is strictly associated to carob trees. However, the ancient carob plantations area now host different vegetation species according to CLC maps.

Furthermore, the analysis to produce risk maps was carried out adopting two different weighting systems: the first considered traps/presence cumulated data (independently from the number of times that X. was recorded), while the second considered the times that the traps resulted positive (not cumulated data).

In El Tello area only traps data are available.

RESULTS FOR SPAIN:

Summary of traps/presence cumulated data (independently from the number of times that X. was recorded):

Zoning class	N. obs
1_0_112	4
1_0_222	8
1_0_242	2
1_0_321	12
2_1_321	1
2_2_321	3

CLC 2011	N. obs	
112	4	Sparse residential areas
222	8	Tree crops
242	2	Complex agriculture areas
321	16	Grasslands

Summary of presence data considered the times that the traps resulted positive (not cumulated data):

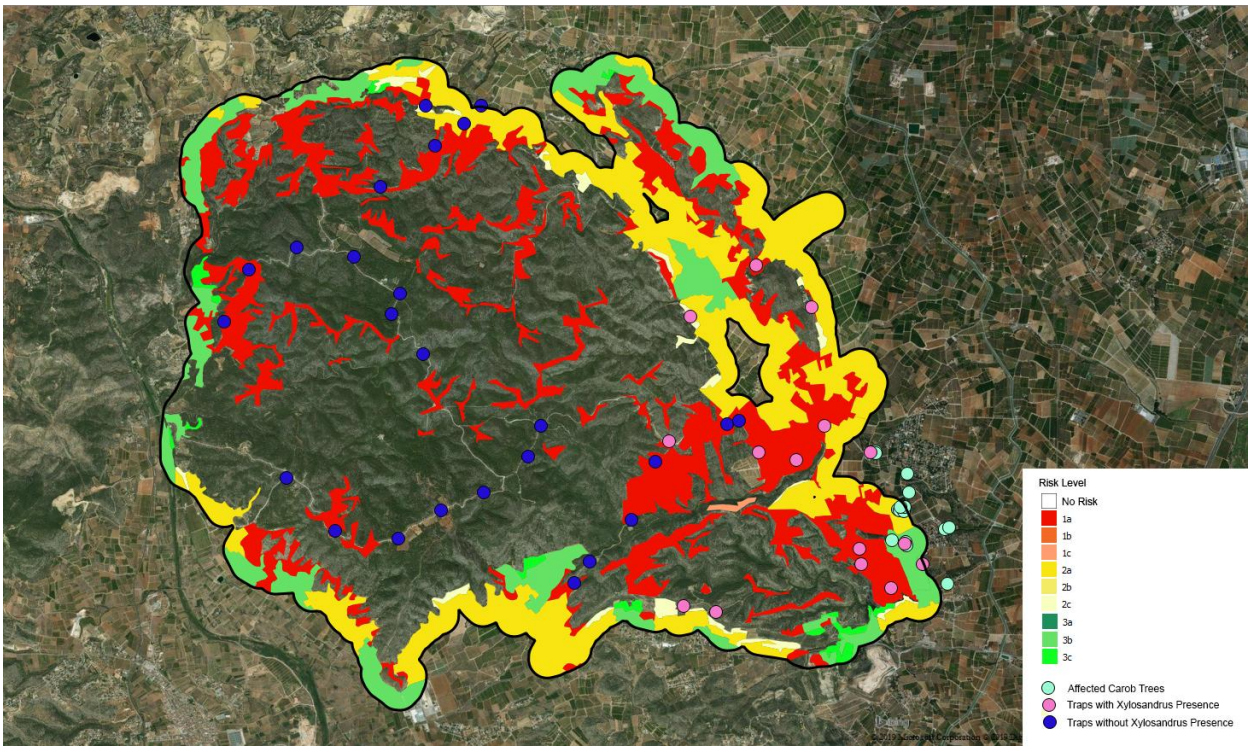
Zoning class	N. obs
1_0_112	6
1_0_222	14
1_0_242	3
1_0_321	17
2_1_321	1
2_2_321	3

CLC 2011	N. obs	
112	6	Sparse residential areas
222	14	Tree crops
242	3	Complex agriculture areas
321	21	Grasslands

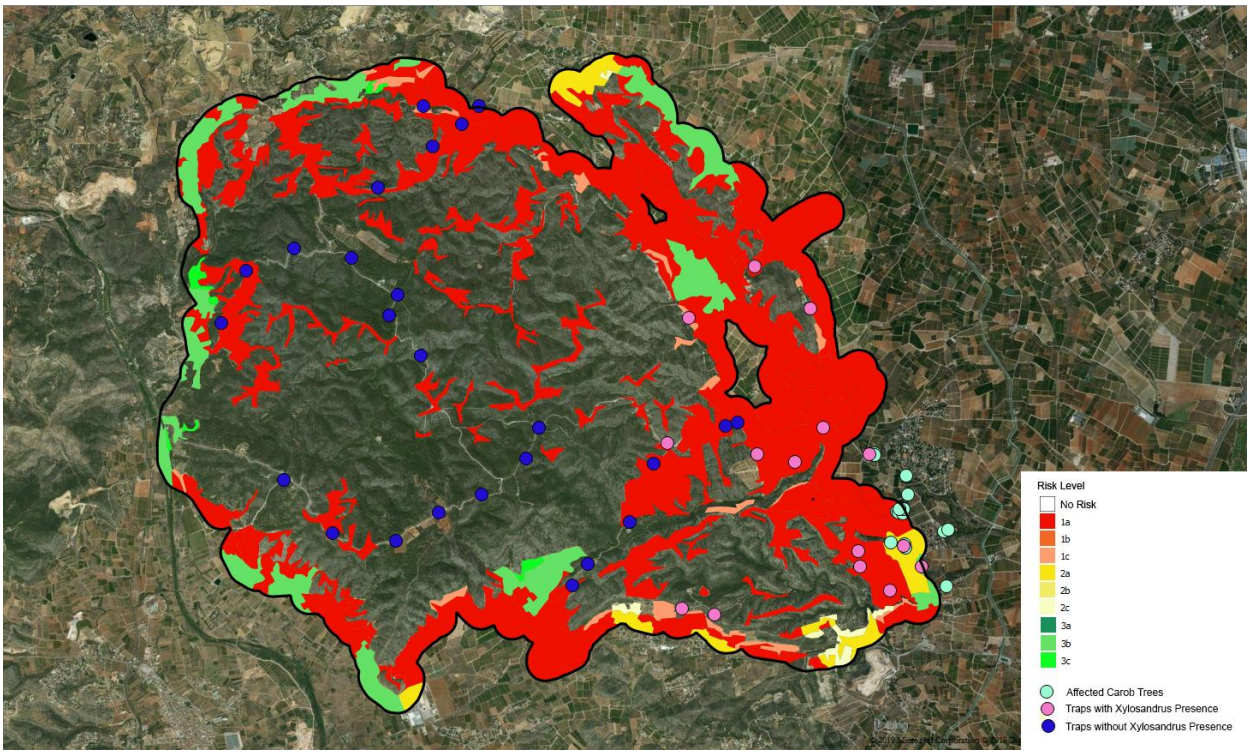
Larger occurrence of X. is related to tree crops areas and natural pasture lands, independently from the adopted approach.

The following maps illustrate the results:

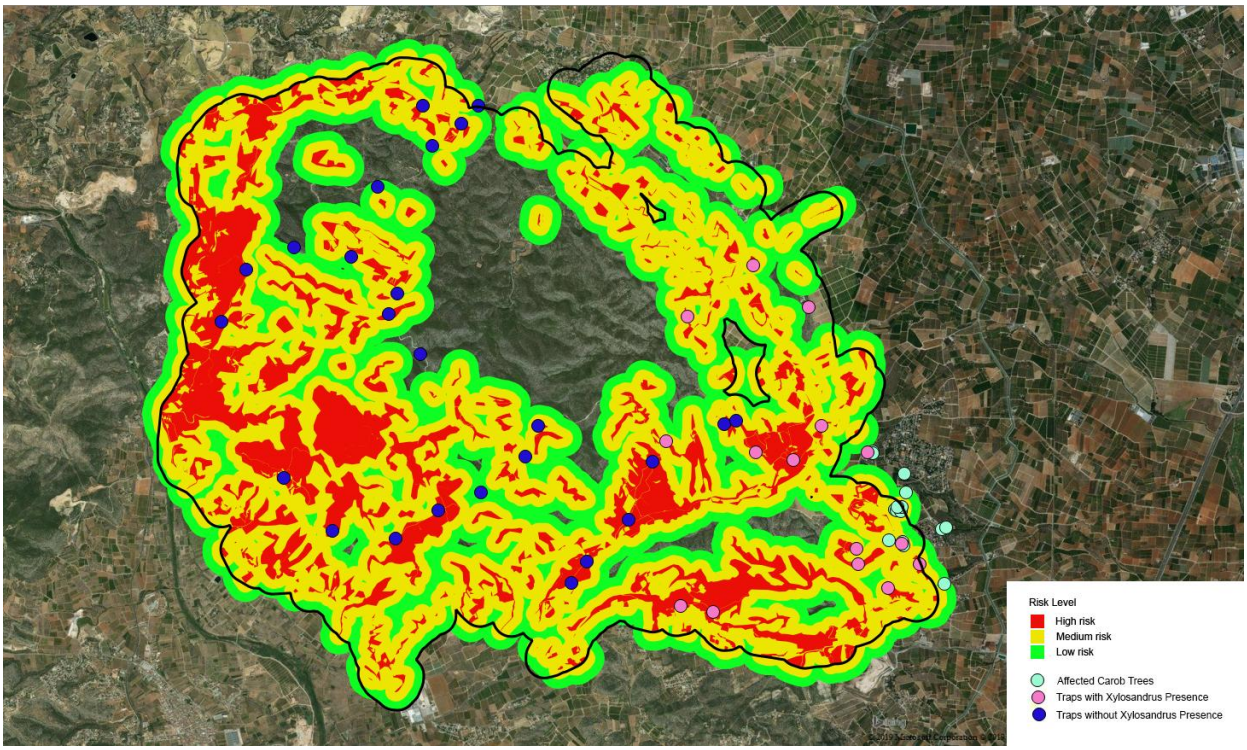
Risk map for the summary of traps/presence cumulated data:



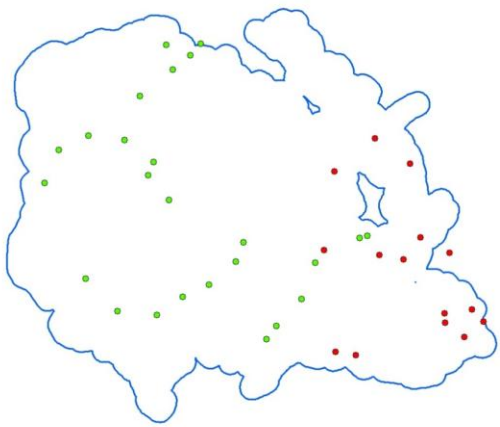
Risk map for the summary of presence data considered the times that the traps resulted positive (not cumulated data):



Finally, the following map illustrates the risk considering the areas with ancient carob plantation as having higher risk class:



Additional data to be collected in future sampling efforts will allow to establish the actual risk related to ancient carob plantations, as at present the X. presence seems to be contained in the eastern portion of the study area, as visible in the last figure here presented, about traps distribution with X. presence (red) or absence (green) data:



CONCLUSIONS

The document presented the methodology and data collected in this first period of project execution. It demonstrates that good results are already available and that the proposed methods can be used in invasions monitoring, especially thanks to the additional monitoring activity planned for years. It also demonstrates that the project staff adopted a flexible approach, often needed in real cases and applied efforts.