Evaluation of the presence of wild boar (*Sus scrofa*) in the municipality of Barcelona from 2010 to 2019

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INTRODUCTION:

As metropolitan areas expand into the natural landscapes wild animals increasingly irrupt inside towns and cities compromising human population and damaging urban green areas. Wild boar (Sus scrofa) presence in Barcelona also follows an increasing trend since 2010.

OBJECTIVES:

Analysing the evolution of wild boar presence from 2010 to 2019 in the urban area of Barcelona, both in time and space. Control measures conducted in this period will also be considered.

MATERIALS AND METHODS:

The study is based on the records made by the Local Police of Barcelona., responsible for registering communications from the citizenship.

The geographical analysis was conducted using QGIS® with GRASS® software and Rstudio® was used to do the statistical evaluation. The study included both the number of cases (total of 6,158) and the distance to the Ronda de Dalt (RD, or B-20 motorway) as a measure of penetration inside the city. The most important management measures undertaken include vegetation clearance of the edge between the city and Collserola and programmed peri-urban captures started in the autumn of 2016 in the Northern districts of Barcelona.

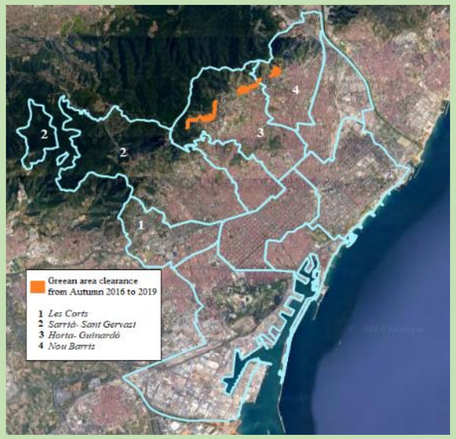


Figure 1 Geographical map of Barcelona showing Collserola Park and the vegetation clearance areas (in orange). Source: Google Maps Satellite

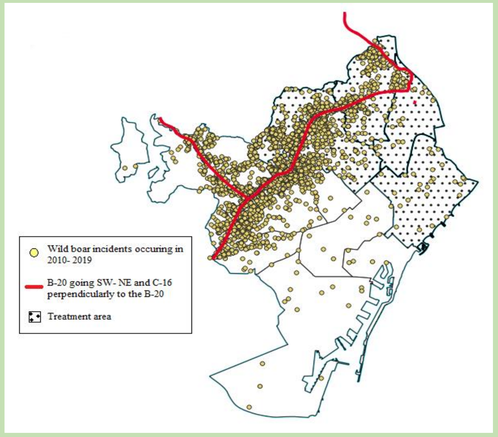
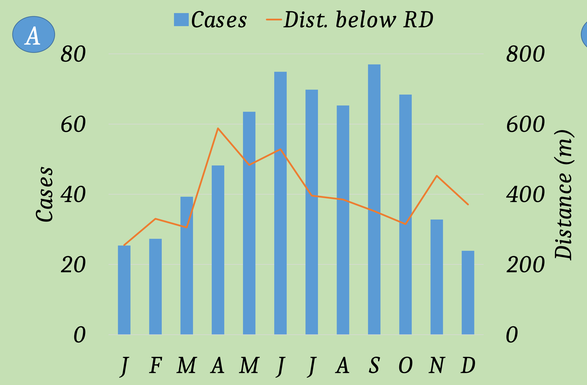


Figure 2 Wild boar cases registered in 2010- 2019 in the Treatment (dotted) and Control (white) areas. The Ronda de Dalt is also indicated (red). Source: QGIS

RESULTS:

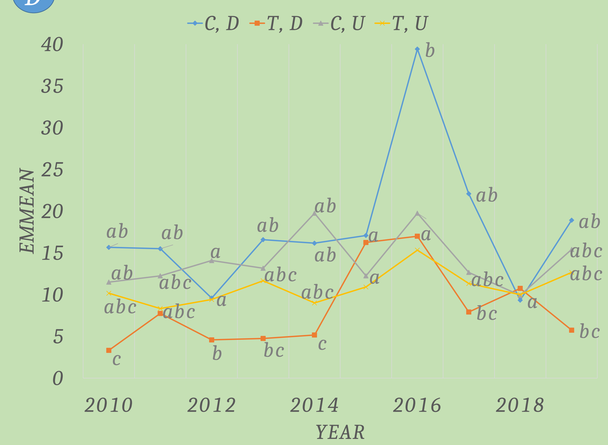
A



C

Year	Ratio (C,D: C,U: T,U: T,D)
2010	4.7 : 3.5 : 3.1 : 1
2011	2 : 1.6 : 1.1 : 1
2012	2.1 : 3.1 : 2.1 : 1
2013	3.5 : 2.8 : 2.5 : 1
2014	3.1 : 3.8 : 1.7 : 1
2015	1.1 : 0.8 : 0.7 : 1
2016	2.3 : 1.2 : 0.9 : 1
2017	2.8 : 1.6 : 1.4 : 1
2018	0.9 : 0.9 : 0.9 : 1
2019	3.3 : 2.7 : 2.2 : 1

D



B

*Linear model: sqrcases ~ Treat.+ Ronda+ Year+ Month+ Treat.*Ronda+ Treat.*Year+ Ronda*Year*

Factor	Df	Mean Square	F. value	p-value
Treatment	1	97,241	77,9001	$< 2,2*10^{-16}$
Ronda	1	6,260	5,0146	0,02564
Year	9	14,670	11,7523	$< 2,2*10^{-16}$
Month	11	28,393	22,7459	$< 2,2*10^{-16}$
Treat: Ronda	1	20,851	16,7037	$5,198*10^{-5}$
Treat.: Year	9	2,892	2,3167	0,01490
Year: Ronda	9	5,188	4,1564	$3,684*10^{-5}$

*Linear model: log.dist. ~ Year+ Month+ Treat.+ Year*Treat.+ Month*Treat.*

Factor	Df	Mean Square	F. value	p-value
Year	9	16,7607	9,6763	$1,035*10^{-14}$
Month	11	9,7156	5,6090	$5,581*10^{-9}$
Treatment	1	9,4706	5,4676	0,01944
Year: Treat.	9	7,1729	4,1410	$2,536*10^{-5}$
Month: Treat.	11	7,7568	4,4782	$9,676*10^{-7}$

A) Evolution of the monthly number of cases and their distance from the RD in the period of 2010-2019.

B) ANOVA table of the factors in the linear models.

C) Yearly ratio of the number of cases in the four studied areas (C,D= Control area below the RD; C,U= Control area above the RD; T,U= Treatment area above the RD; T, D= Treatment area below the RD).

D) Evolution of the yearly number of cases in the four studied areas from 2010 to 2019 (a,b,c: means with different superscript are significantly [p<0.05] different from each other for a given year).

CONCLUSIONS:

- *Wild boars appear most in the city in the hottest periods, but seasonality differs between the amount of cases and the penetration in the urban area*
- *The management measures had a transient and low effect in reducing wild boar presence*
- *Future control measures should focus below the RD*
- *More research should be done to determine why the wild boars decide to go deeper inside the city*