WILDCAT DENSITY, TRAPPING RATE AND THE ROWCLIFFE'S EQUATION: FIVE YEARS OF DATA FROM SICILY SUPPORTING THE GOODNESS OF THE METHOD

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INTRODUCTION AND STUDY AREA

Camera trapping has become an efficient and popular method to assess biodiversity and abundance of a large variety of species. One of the most widespread target of camera trapping is to estimate density of spotted and stripped felids in a wide range of habitats. Recent studies have pointed out that the photographic rate of capture is correlated with the density, in principle "most individuals, most pictures".

We report our results on the analysis of how photographic capture rate of wildcat is strongly correlated with the estimate of population size obtained through camera trapping data during five years of monitoring on the Etna volcano.

Figure 1 - A: Etna volcano in Sicily.; B: the study area.

MATERIALS AND METHODS

In 2006 we placed in opportunistic locations camera traps in order to gain experience and training: we monitored 18 trapping stations for a total of 824 trapping days during two periods: in the first period (518 trap-days) we used an attractive scent, while no attractors were used in the second (306 trap-days).

Based on the results of this survey, we decided to space the trapping stations at approximately 1 km apart, to set the time period of each trapping station to 60 days (approximately two chances to detect wildcat's presence). Further, we avoided to use any kind of attractors that could produce differential responses (sex, age, or social position) and we applied standardized capture-recapture analyses and F.M.M.D.M. (Full Mean Maximum Distance Moved) as buffer strip to the study area.

In 2007 we placed two trapping lines for a total of 11 stations reaching 671 trap-days.

In 2008 we started to use camera traps in pairs at each station in order to obtain pictures of both wildcats' sides. We monitored two trapping lines for a total of 12 stations reaching 732 trap-days.

In 2009 we monitored two trapping lines for a total of 18 stations reaching 1080 trap-days.

In 2010 we repeated the same monitoring protocol undertaken during 2009.

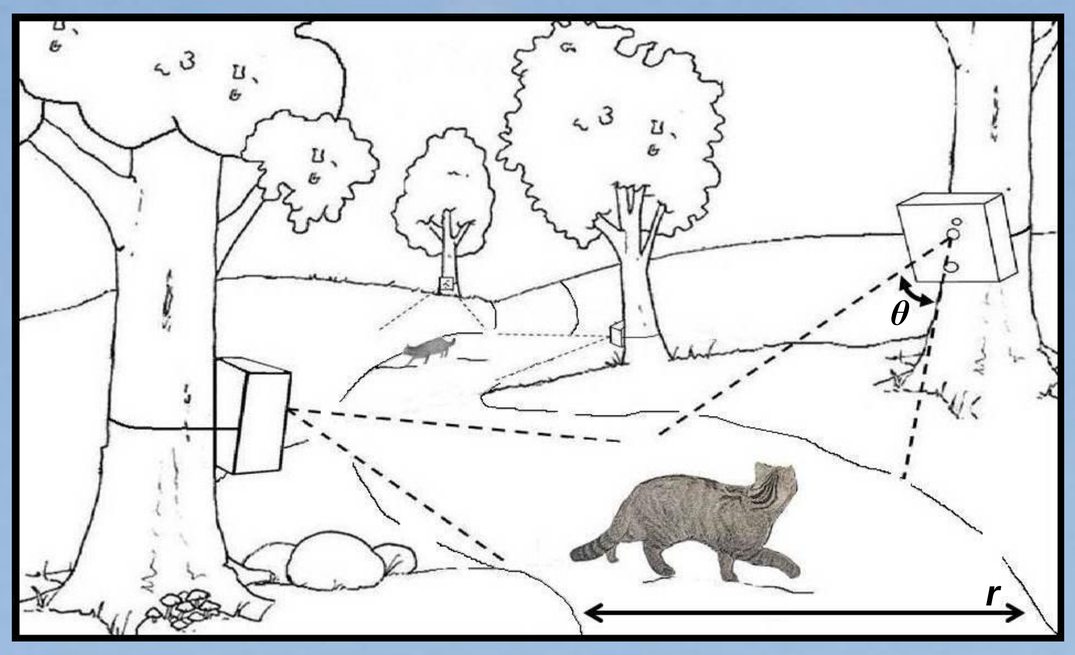

Figure 2 – Camera traps detection parameters (Rowcliffe's equation): *r* = radial distance, *θ* = angle.

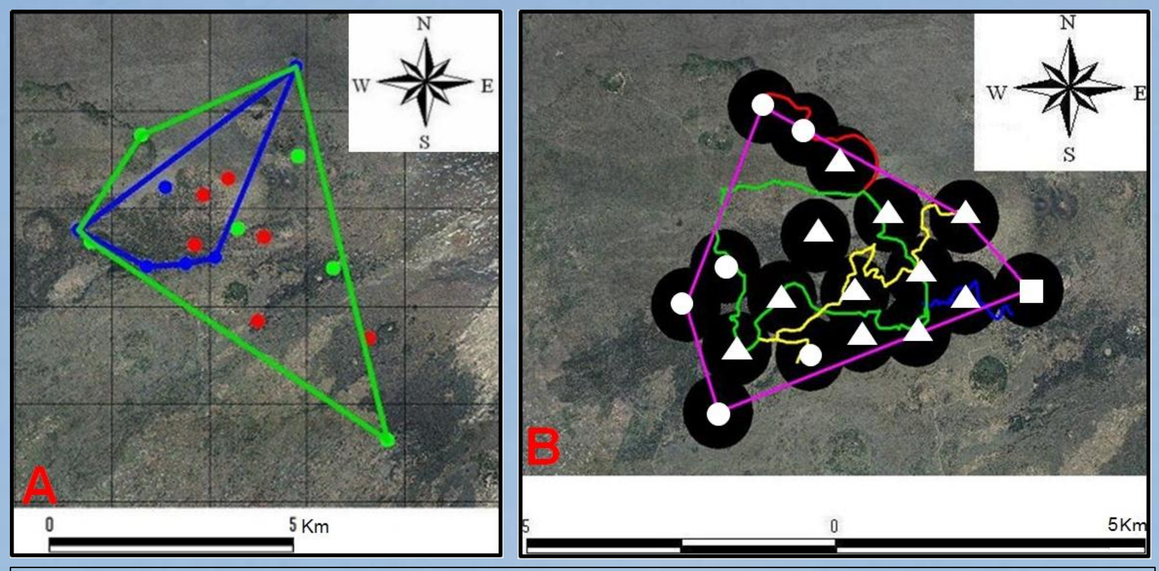

Figure 3 - A: stations monitored in 2006: green and red points are the camera traps positive and negative for the wildcat. The blue dots are the 6 camera traps that have taken pictures from which it was possible to discriminate the minimum number of specimens. The green polygon (MPC) delimits the area monitored by camera traps, the blue polygon (MPC) delimits the area in which were photographed the various specimens;
B: the stations monitored in the year 2007 (triangles = 11), 2008 (square = 12), 2009 and 2010 (circles = 18): camera traps have a buffer of 500 m (black), the pink polygon (MPC) defines the area monitored by camera traps and the colored lines are the four transects repeated weekly for the scat collection.

RESULTS

In 2006 we gained 24 pictures of wildcat (14 and 10 respectively) from 12 of 18 camera trapping stations and we identified 9 individuals (6 in the first period and 3 in the second): the rate of capture success was 1/34,3 trap-nights and the minimum wildcat density was 0,45 (wildcat/100 ha).

In 2007 we obtained 27 wildcat pictures from 7 of 11 trapping stations and we identified 9 individuals (we excluded one kitten): the rate of capture success was 1 capture/24,9 trap-nights and the minimum wildcat density was 0,46 (wildcat/100 ha).

In 2008 6 events of capture produced 8 pictures (in two occasions the camera traps worked simultaneously obtaining pictures of both sides of the wildcat) from 4 trapping stations and we identified 3 specimens: the rate of capture success was 1capture/122 trap-nights and the minimum wildcat density was 0,06 (wildcat/100 ha).

In 2009 32 events of capture produced 42 pictures (in 10 occasions the camera traps worked simultaneously obtaining pictures of both sides of the wildcat) from 12 trapping stations and we identified 10 specimens (we exclude 4 kittens): the rate of capture success was 1 capture/33,8 trap-nights and the minimum density was 0,22 (wildcat/100 ha).

In 2010 we obtained 67 events by 16 stations and we identified 14 individuals (we exclude two kittens). The rate of capture success was 1/16,1 trap-nights and the minimum density was 0,41 (wildcat/100 ha).

Finally we plotted:

1) the number of specimens identified during five years of monitoring against the related rate of capture success (R^2= 0,83)

2) the density calculated during five years using standard capture-recapture analysis against the related rate of capture success (R^2 = 0,90).

We applied the Rowcliffe' s equation to estimate densities of wildcats during 2006-2010: the values obtained were 2006 = 0,30; 2007= 0,41; 2008= 0,08; 2009= 0,21; 2010= 0,38.

Table 1

Years	2006	2007	2008	2009	2010
Camera Trapping density	0,45	0,46	0,06	0,22	0,41
Rowcliffe density	0,30	0,41	0,08	0,21	0,38
Rate of capture success	1/34,3	1/24,9	1/122	1/33,8	1/16,1
Events	24	27	6	32	67
Night trap	824	671	732	1080	1080
Individuals	9	9	3	10	14
Stations	18	11	12	18	18
Positive stations	12	7	4	12	16
FMMDM	(*)	1160	2200	1870	1367
Area	2000	1906	4322	4588	3343

Table 2

Years	2006	2007	2008	2009	2010
Camera	*Deercam®* 300 *Deercam®* 200	*Deercam®* 300 *Deercam®* 200	*Deercam®* 300 *Deercam®* 200	*DFV® 7,2 megapixels*	*DFV® 7,2 megapixels*
r	0,00125	0,00125	0,00125	0,00150	0,00175
Θ	4,175	4,175	4,175	4,94	4,94
v	2,44	2,44	2,44	2,44	2,44
G	1	1	1	1	1

Table1- Camera trapping results during 5 years of monitoring; (*) no recaptures were detected.
Table 2- Results obtained applying the Rowcliffe's equation.

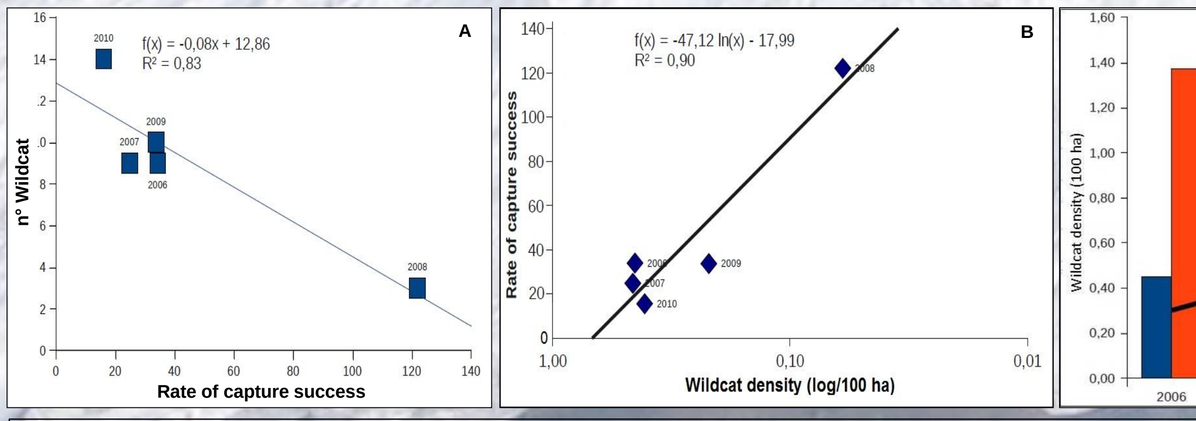

Figure 4 - A: linear regression between number of individuals identified and the rate of capture success. B: linear regression between the rate of capture success and wildcat density (note logarthimic scale) for five years of monitoring. C: minimum (blue) and maximum (red) density for camera trapping; line: values for Rowcliffe's density.

Figure 5 - Wildcat pictures taken during the five years of monitoring.

DISCUSSION

We think that these results, in accordance with previous studies, support the usefulness of camera trapping to estimate density even when the target species doesn't have morphometric criteria to allow individual identification. Moreover these results also suggest that: a) our setting parameters of camera traps are suitable for the wildcat population that lives in this unique Mediterranean habitat; b) our estimates of wildcat specimens through the analysis of pictures are reasonable; c) there is a correlation between camera trapping rates and density; d) there's an overlap between camera trapping density and Rowcliffe's equation density. Scat surveys could represent an alternative and complementary (providing information on sex, diet and presence of parasites) as sources of DNA for molecular genetic marker analysis.

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