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Effects of weight and temperature on defecation index of caged European rabbits

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KEYWORDS : abundance or density ; Oryctolagus cuniculus ; pellet count

Introduction
Direct and indirect methods are currently used to estimate wild rabbit abundances and population trends. Pellet counts in cleared plots per unit area is a good indirect method to estimate rabbit abundance at small level (protected areas or game farms) as can latrines per unit of distance is a good indirect method to estimate rabbit abundance at larger scales. Nevertheless, to estimate absolute densities, it is necessary to correct for defecation rates and ground pellet persistence. While pellet persistence must be relieved in the field during pellet count, defecation index cannot be relieved during pellet count and a general or bibliographic value is commonly used to estimate absolute densities. However defecation index is influenced by several factors so that general value can lead to biasing, for this reason we studied the effect of the rabbit body weight and the ambient temperature on the defecation index.
Material and methods
The study involved 12 captivity-born adult European rabbits coming from Tuscany (Italy), weighting 1,604-2,512 g. Rabbits were individually caged and fed ad libitum with a commercial pellet (17.4% crude protein, 17.2% crude fiber, 2.6% crude fat, 10.1% ashes, and 40.9% N-free extract) and alfalfa hay; water was also provided *ad libitum* by nipples. After a period of adaptation to cages the animals were submitted to two different ambient temperature 10°C and 18°C. The total number of faecal pellets dropped per rabbit was measured every day during five non consecutive days at each temperature. One hundred pellet from each rabbit was used for the dry matter determination. Data collected were submitted to multiple regression analysis to predict the defecation index in relationship to rabbit weight and ambient temperature.
Results
The average weight of the rabbits was 2.02±0.344 (Kg±std.dev); the number of fresh faecal pellets dropped per rabbit in 24h was 293±33.4 (n±std.dev). The weight of fresh faecal pellets dropped per rabbit was 114±20.4 (g±std.dev). The weight of dried faecal pellets dropped per rabbit was 57±4.8 (g±std.dev). Relationship between number of excreted pellet and weight with temperature were : defecation-index number = 317 + 46*weight -10*Temperature (R2Adg=0.82); defecation-index dried-weight = 35,4+ 15,45*weight -1.47*Temperature (R2Adg=0.93).
Discussion
Although data from captive animals are open to objections, these first results can be used to improve rabbit density estimations. Our results show that, to compare data coming from different populations and seasons, the defecation index of the wild rabbit should be adapted to the body weight which characterizes the populations to be censused and the different average temperatures observed during the pellet counting. The weight of dried faecal pellets collected in cleared plots per unit area seems a better parameter than the number to estimate the rabbit population size.

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Effects of body weight and environmental temperature on defecation index of caged European rabbits

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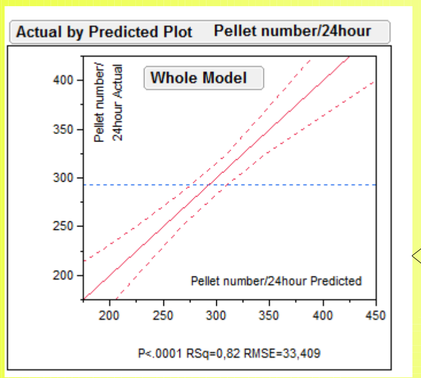
Results

The average body weight of the rabbits was 2.02±0.344 (Kg±std.dev); the number of fresh faecal pellets dropped per rabbit in 24h was 293±33.4 (n±std.dev). The weight of fresh faecal pellets dropped per rabbit was 114±20.4 (g±std.dev). The weight of dried faecal pellets dropped per rabbit was 57±4.8 (g±std.dev). Relationship between number of excreted pellet and weight with temperature were: defecation-index number = 317 + 46*weight -10*Temperature (R^2_{Adg}=0.82); defecation-index dried-weight = 35,4 + 15,45*weight -1.47*Temperature (R^2_{Adg}=0.93).



Summary of Fit	
RSquare	0,81517
RSquare Adj	0,794634
Root Mean Square Error	33,40895
Mean of Response	293,4921
Observations (or Sum Wgts)	21

Analysis of Variance

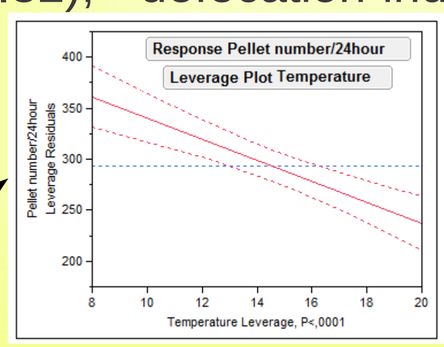
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	88608,40	44304,2	39,6935
Error	18	20090,85	1116,2	Prob > F
C. Total	20	108699,25		<,0001*

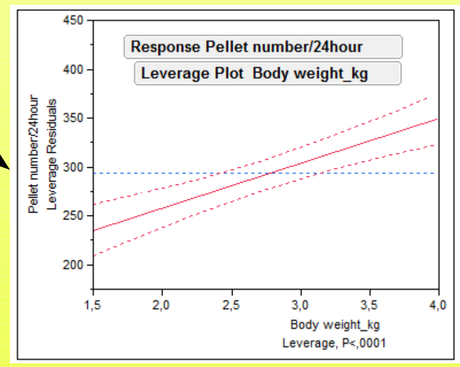
Lack Of Fit

Source	DF	Sum of Squares	Mean Square	F Ratio
Lack Of Fit	15	19516,346	1301,09	6,7942
Pure Error	3	574,500	191,50	Prob > F
Total Error	18	20090,846		0,0701
				Max RSq
				0,9947

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	316,89985	39,37904	8,05	<,0001*
Temperature	-10,31486	1,883028	-5,48	<,0001*
Body weight_kg	45,781921	7,992648	5,73	<,0001*





Summary of Fit	
RSquare	0,932244
RSquare Adj	0,924716
Root Mean Square Error	4,842931
Mean of Response	56,78226
Observations (or Sum Wgts)	21

Analysis of Variance

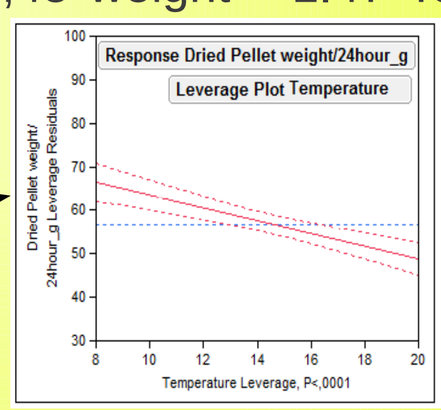
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	5808,6204	2904,31	123,8302
Error	18	422,1716	23,45	Prob > F
C. Total	20	6230,7919		<,0001*

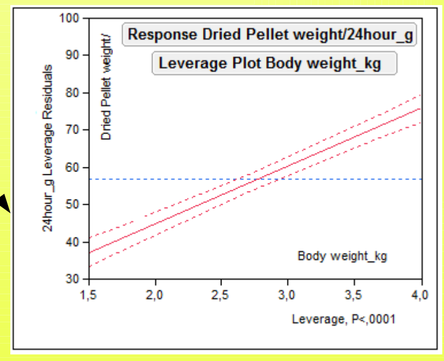
Lack Of Fit

Source	DF	Sum of Squares	Mean Square	F Ratio
Lack Of Fit	15	399,64228	26,6428	3,5478
Pure Error	3	22,52928	7,5098	Prob > F
Total Error	18	422,17157		0,1623
				Max RSq
				0,9964

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	35,35261	5,708349	6,19	<,0001*
Temperature	-1,468915	0,272962	-5,38	<,0001*
Body weight_kg	15,453916	1,158607	13,34	<,0001*





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The weight of dried faecal pellets collected in cleared plots per unit area seems a better parameter than the number to estimate the rabbit population size.

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