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ON THE USE OF TRACKING-PLATES TO VERIFY THE PRESENCE OF THE EUROPEAN POLECAT (*MUSTELA PUTORIUS*)

RICCARDO FONTANA[1*], AMBROGIO LANZI[1], ELENA LELLI[2], ELISA ARMAROLI[3]

[1]Studio Professionale Fontana-Gianaroli-Lanzi, Via Togliatti 1/V, 42048 Rubiera (RE), Italy; *Corresponding author, e-mail: studio@studio-geco.it
[2] via Nazionale per Carpi, 1033, 41010 Modena, Italy
[3]via Grieco, 1, 42019 Scandiano (RE), Italy

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RIASSUNTO - ***Sull'impiego delle trappole a passaggio* (tracking-plates) *per l'accertamento della presenza della puzzola* (Mustela putorius)**. Applicando analisi statistiche multivariate, è stata testata la validità di un metodo di identificazione della puzzola (*Mustela putorius*) basato sul rilevamento di quattro misure standard delle impronte, ottenute tramite *tracking plates*. Le analisi hanno riguardato una collezione di 131 impronte, in gran parte ottenute da puzzole, furetti (*Mustela putorius furo* vel *M. furo*) e faine (*Martes foina*) in cattività. I risultati confermano l'elevato potere delle tecniche di analisi impiegate nella separazione dei generi *Martes* e *Mustela*. L'utilizzo di *tracking-plates* si conferma un efficace metodo da impiegare nelle indagini di campo.

Parole chiave: *Mustela putorius*, impronte, distribuzione, analisi discriminante, regressione logistica

Tracking-plates, thanks to the advantages they provide (limited field crew and non-invasiveness) in comparison to traditional forms of capture, have been frequently used, particularly in North America, in the study of a large number of *taxa*, including mustelids (Orloff *et al.*, 1993; Zielinski and Kucera, 1995; Nams and Gillis, 2003). In 2004 we applied this methodological approach in the northern Appennines (Parco del Frignano) in order to detect the presence of the European polecat (*Mustela putorious*). We found 23 polecat-like footprints, from which four standard measures were obtained (Fontana *et al*., 2007). Using statistical analysis it was possible to clearly distinguish between the *Mustela* and *Martes* genera, while the differences between the European polecat and the ferret (*Mustela putorius furo* vel *M. furo*) were less clear. We suggested that it would be opportune to carry out a nationwide census of the facilities that host specimens of European polecats, stone martens (*Martes foina*) and ferrets in order to generate a footprint database useful for further analysis.

During 2008, we carried out this investigation throughout Italy, involving both parks and rescue centres. We were able to obtain footprints from three stone martens (two males and one female), six ferrets (two males and four females), and three European polecats (two males and one female).

The aim of the present study was to verify the robustness of the findings obtained by

Fontana et al. (2007) by using a larger and more detailed sample of footprints collected from known species and by integrating statistical analyses. Including the 23 footprints collected in the field in our previous study and attributed to the European polecat (Fontana *et al*., 2007), we considered a total of 131 footprints which were clear enough to collect with our standard measures used by Fontana *et al*. (2007). Collected data underwent both discriminant analysis (Roessler and Ungerer, 2006) and logistic regression (Hosmer and Lemeshow, 2000). Data processing was performed using SPSS 10.0.1 for Windows. Discriminant analysis (Table 1), performed with the stepwise method and using three groups of categorical dependent variables (European polecat, ferret and stone marten), correctly classified 84.7% of cases. The footprints of European polecats were almost always correctly classified (97.4% of cases), whilst the risk of confusing the two *taxa* of the genus *Mustela* persisted. A forward stepwise logistic regression analysis was performed, grouping together European polecats and ferrets in a single category, in order to further verify the efficacy of the biometric measures used for discriminating the samples collected.

The resulting logistic model (Table 2) which best describes our data set includes

Table 1 - Results of the discriminant analysis (standard measurements of mustelids footprints: A = from the distal edge of the foremost toe to the back edge of the palm pad; B = maximum width; C = height of palm pads; D = width of palm pads, see Fontana *et al*., 2007).

VARIABLES	FUNCTION	
A-B-C-D	1	2
Eigenvalue	5.31	0.02
Variance (percent)	99.50	0.5
Percent cumulative	99.50	100
Canonic correlation	0.92	0.16
Wilks Lambda	0.15	0.98
χ^2	237.16	3.12
Degrees of freedom (d.f.)	8	3
P	<0.01	0.21
Standardized coefficients	1	2
A	0.74	-0.69
B	0.31	-0.28
C	0.24	1.15
D	0.11	-0.93

CLASSIFICATION RESULTS				
	N	Polecat	Ferret	Stone marten
Polecat	36	29	7	0
Ferret	56	12	44	0
Stone marten	39	1	0	38

Table 2 - Results of the logistic regression analysis (for abbreviations of the morphometric measurements of footprints see Table 1).

GOODNESS OF FIT				
		χ^2	d.f.	P
-2 Log-Likelihood		140.43	4	<0.001
Hosmer and Lemeshow test		0.89	8	0.99
Cox and Snell R^2			0.66	
Nagelkerke R^2			0.93	
VARIABLES IN THE MODEL				
	Wald	P	Exp(B)	95% CI for Exp(B)
A	27.13	<0.001	12.58	11.67 - 13.49
B	14.52	<0.001	5.46	4.72 - 6.19
C	16.63	<0.001	7.38	6.51 - 8.25
D	7.66	<0.001	-3.17	-3.98 - -2.36
CLASSIFICATION RESULTS				
		N	*Mustela*	Stone marten
Mustela		92	92	0
Stone marten		39	0	39

all four independent variables and correctly distinguishes the footprints of the two groups in all cases. Considering that, currently, in Italy there is no population of either ferrets or ferret-European polecat hybrids (Genovesi and De Marinis, 2003), this additional information confirms the potential of *tracking plates* for outlining the distribution of the polecat and as a preliminary tool to plan ecological studies carried out through time-expensive techniques, as, for example, radiotracking (Striglioni, 1998).

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