INDUCTIVE MODELS TO MONITOR THE CONSERVATION STATUS OF UNION INTEREST SPECIES: FIRST RESULTS

REGIONE LAZIO
AGENZIA REGIONALE PARCHI
WWW.ARPLAZIO.IT

PIZZOL I.[1], SCALISI M.[2], SINIBALDI I.[2], CAPIZZI D.[2], SARROCCO S.[2]

[1] *Università degli Studi della Tuscia, Dipartimento Scienze Ecologiche e Biologiche*
[2] *Regione Lazio, Agenzia Regionale per i Parchi*

UNIVERSITÀ DEGLI STUDI DELLA Tuscia

INTRODUCTION

The EU Habitats Directive (92/43/EEC) protects several habitat types and species defined as of "Union concern". All Member States are required to establish surveillance systems to periodically evaluate the conservation status of such habitat types and species. European-level guidelines (Douglas and Arvela, 2011) identify four parameters that, combined in a general evaluation matrix, allow for the assessment of the conservation status according to four classes:

Favourable	Unfavourable - Inadequate	Unfavourable - Bad	Unknown

The four parameters identified for the species are: range; population; habitat for the species; future prospects. We are testing the feasibility of using inductive distribution models as useful tools to measure two of these parameters at the regional scale: the extent of the "range" and "habitat for the species". Inductive distribution models use presence, presence/absence or density data to define the potential distribution of species, assuming that this can be estimated based on the distribution of a series of environmental variables.

METHODS

We are currently testing the feasibility of utilizing inductive distribution models to assess species conservation status by using the MaxEnt and Biomapper software packages (Phillips *et al.*, 2006; Hirzel *et al.*, 2002) on selected mammal species of conservation concern. Preliminary results obtained with MaxEnt on a restricted set of nine species, and based on different sets of environmental variables, are shown here.

Species	AUC 34 variables	AUC 22 variables	N samples
Canis lupus	0.92	0.91	647
Felis silvestris	0.97	0.95	111
Lepus corsicanus	0.98	0.93	349
Martes martes	0.95	0.93	137
Muscardinus avellanarius	0.87	0.82	378
Mustela putorius	0.95	0.93	87
Rupicapra pyrenaica ornata	0.98	0.98	200
Ursus arctos marsicanus	0.98	0.97	328

Table 1. AUC discrimination level of the MaxEnt models with both sets of environmental variables

Distribution models were developed, based on a 100x100 m grid covering the whole Lazio region, using a geodatabase of approximately 18,000 occurrence records of 19 species of mammals (Capizzi *et al.*, 2012), and two different sets of layers representing the distribution of various environmental variables. The first set included in particular land-use variables obtained from third-level Corine Land Cover classes, as well as altimetry, slope and aspect. Land-use variables in the second set were instead derived from a more detailed land cover map with fourth- and fifth-level Corine classes, and layers describing woodland structure and coverage were also included in addition to altimetry, slope and aspect. In both cases, occurrence of each land use class was converted into layers with continuous values representing distance to the closest pixel where that class occurs. Correlated variables (r = ± 0.70) were left out from model calculations, iteratively retaining only the most representative variable of each pair, and thus obtaining two final sets respectively of 22 and 34 variables.

FIRST RESULTS

For the eight species considered, the AUC discrimination level of the MaxEnt models was «excellent» or «outstanding» (Hosmer and Lemeshow 1989) with both sets of environmental variables (tab. 1). The extent of the suitability classes obtained for several species presents however substantial differences, which could strongly influence the «range» and «habitat species» parameters assessment. Table 2 and the two figures below show as an example the extent of suitability classes for two of the species considered.
We suspect that such differences may originate among other things from the different levels of detail of the land-cover base maps in the two data sets. We expect to test such hypothesis, and to further assess the reliability of models developed with different algorithms and environmental data-sets, by applying the two software packages to a series of "chimera" species, i.e. ideal model-species with pre-defined and known occurrence, habitat selection and population distribution.

Ursus arctos marsicanus					
Suitability classes	**0-0,1** (null)	**0,1-0,25** (low)	**0,25-0,5** (medium-low)	**0,5-0,75** (medium-high)	**0,75-1** (high)
Extent(%)MaxEnt 22 var	93.10	3.43	2.30	1.03	0.14
Extent(%)MaxEnt 34 var	96.76	1.60	0.63	0.93	0.09
Lepus corsicanus					
Suitability classes	**0-0,1** (null)	**0,1-0,25** (low)	**0,25-0,5** (medium-low)	**0,5-0,75** (medium-high)	**0,75-1** (high)
Extent(%)MaxEnt 22 var	70.84	14.29	9.36	4.1	1.41
Extent(%)MaxEnt 34 var	88.57	7.24	3.10	0.98	0.10
Extent(%)ENFA 22 var	68.24	15.35	10.56	4.88	0.97

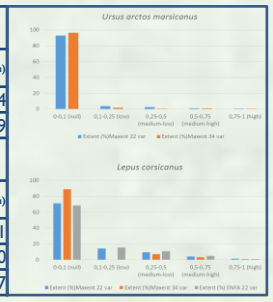
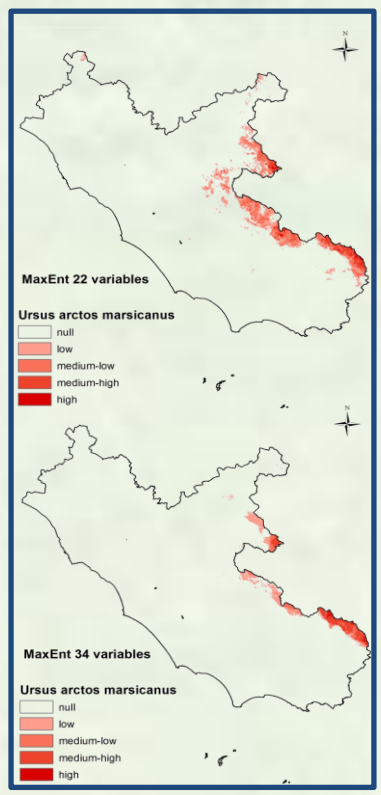
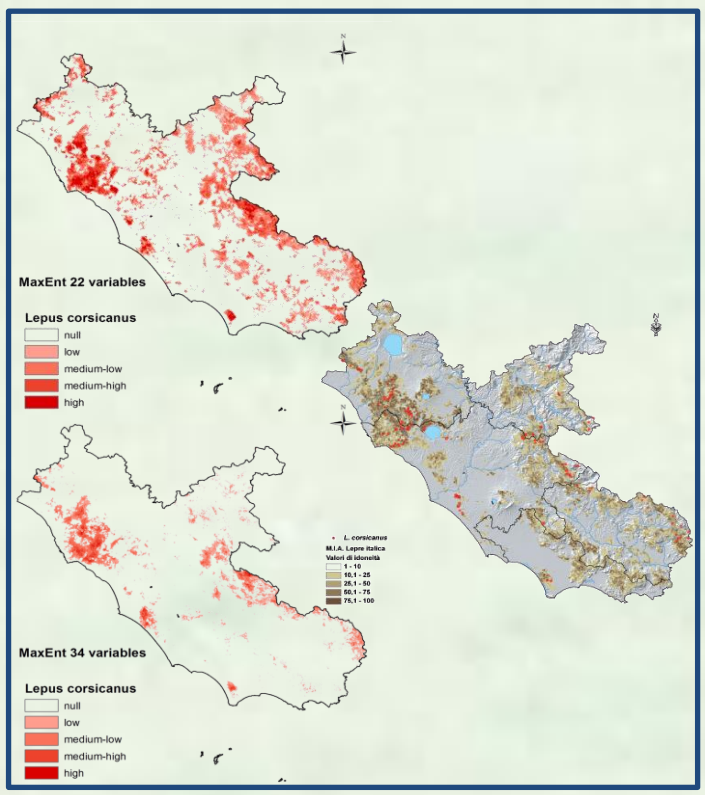


Table 2. Extent of suitability classes for two species.





REFERENCES

Capizzi, D., Mortelliti, A., Amori, G., Colangelo, P., Rondinini, C. (a cura di), **2012**. I mammiferi del Lazio. Distribuzione, ecologia e conservazione. Edizioni ARP, Roma. ■ **Douglas E. and Arvela M.** (compiled by), **2011**. Assessment and reporting under Article 17 of the Habitats Directive Explanatory Notes & Guidelines for the period 2007-2012. Final Draft July 2011. European Topic Centre on Biological Diversity. ■ **Hirzel A. H., Hausser J., Chessel D., Perrin N., 2002**. Ecological Niche Factor Analysis: how to compute habitat-suitabiity maps without absence data?. Ecology, 83(7), pp. 2027-2036. ■ **Hosmer, D.W. and S. Lemeshow, 1989**, Applied logistic regression. John Wiley & Sons, New York. ■ **Phillips, S.J., R.P. Anderson, and R.E. Schapire, 2006**. Maximum entropy modeling of species geographic distributions. Ecological Modelling, 2006. 190(3–4): p. 231-259.

REGIONE LAZIO