Environmental factors affecting wild boar (Sus scrofa) hunting yield in southern Tuscany.

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Abstract: Hunting bags should be a good measure of wild boar (Sus scrofa) abundance and/or density and can be used to analyze habitat population relationships. For this reason, the wild boar harvest of fifteen hunting areas located in southern Tuscany (from 2000 to 2004) was investigated in order to evaluate the effect of fifteen environmental variables measured by a G.I.S. software.

For each hunting area the percentage of 13 land use classes was measured by intersecting hunting areas with a digitized land-use map. Moreover the percentage of perimeter of hunting areas bordering with protected woody areas and the percentage of main water bodies were measured. Correlation and regression analyses were carried out considering the harvest density as a dependent variable. Twelve multiple regression models, each including three environmental variables were ranked by the information-theoretic approach (modified Akaike’s information criterion).

Protected woody areas (Parks and Wildlife Refuges), where hunting it is not allowed, resulted the most important variable predicting positively wild boar hunting yields. Also young woodlands (naturally regenerated or by coppice), chestnut woods and conifer woods showed a positive effect.

Models obtained from hunting data and digitized land use maps can be very useful to plan wild boar population management at local scale. These data are generally available or quickly collectable. However habitat population relationships should be carefully interpreted considering the possible land use modifications from maps elaboration as a consequence of forest management.

Keywords: Land use, woodlands, protected areas, management, AICc
Environmental factors affecting wild boar (Sus scrofa) hunting yield in southern Tuscany

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Abstract
Hunting is a good measure of wild boar (Sus scrofa) abundance and density and can be used to analyze habitat population relationships. For this reason, the wild boar hunting season in southern Italy (Tuscany) has been investigated in order to evaluate the effect of different environmental variables on population density and hunting yield. For each hunting season the percentage of 15€ range chases was measured by intersecting hunting areas with a digitized landscape map. Moreover, the percentage of pedestrian areas and the percentage of wooded areas were measured. Correlation and regression analyses were used to determine the effect of environmental variables on hunting yield. The results confirm that the hunting yield in different regions is related to the environment and that the percentage of wooded areas is a better predictor of wild boar hunting yield. Also, young wild boars (cub) are more common in wooded areas and older wild boars are more common in grassed areas. Models of hunting yield from the 15€ range were developed for the entire hunting area and for wooded and grassed areas separately. These models can be useful tools for e.g. the evaluation of hunting yield and the management of wild boar populations. However, habitat population relationships should be carefully investigated concerning the possible hunting yield modifications from management as a consequence of forest management.

Introduction
Since about 1985, in many parts of Europe, populations of wild boar (Sus scrofa) have remarkably increased, and the species have recolonized areas where it was disappeared from centuries. The wild boar is widely distributed in Europe, from the Alpes in the northern part of the country to the Mediterranean sea in the south. Moreover, the wild boar has very successfully invaded other continents, such as Australia and New Zealand. However, the risk of biological invasions as extensive destruction of arable land and displacement of agricultural fields, has probably played an important role.

The wild boar population also has increased the conflicts with human activities. Wild boar space consumption damages to agricultural crops (particularly corn and rice), in Tuscany, more than 700 million euros a year are paid as compensation for crop damage. Hunting has, therefore, a role in the conservation of the wild boar. More than 250,000 boars and 120,000 hinds are hunted yearly in the Tuscan region. Bag records are considered a good measurement to estimate the population density of wild boar and can be used to analyze habitat population relationships instead of abundance data. However, hunting records are only the result of a complex relationship between many variables. The present study was carried out in order to investigate the relationship between the relative abundance of wild boar (as wild boar hunting yield) and the main environmental variables, with the aim of building a model of realistic hunting yield in wild boar population management.

Modeling
Hunting yield is a measure of wild boar abundance and density. It is often used as an index of the population density, but is also related to the environmental variables. The wild boar hunting season in southern Italy (Tuscany) has been investigated in order to evaluate the effect of different environmental variables on population density and hunting yield. For each hunting season the percentage of 15€ range chases was measured by intersecting hunting areas with a digitized landscape map. Moreover, the percentage of pedestrian areas and the percentage of wooded areas were measured. Correlation and regression analyses were used to determine the effect of environmental variables on hunting yield. The results confirm that the hunting yield in different regions is related to the environment and that the percentage of wooded areas is a better predictor of wild boar hunting yield. Also, young wild boars (cub) are more common in wooded areas and older wild boars are more common in grassed areas. Models of hunting yield from the 15€ range were developed for the entire hunting area and for wooded and grassed areas separately. These models can be useful tools for e.g. the evaluation of hunting yield and the management of wild boar populations. However, habitat population relationships should be carefully investigated concerning the possible hunting yield modifications from management as a consequence of forest management.

Methods
The study area covered about 71 km² of wild boar habitat in the Province of Pisa (Tuscany, Italy). The study area was divided into five 15€ range cells (3.6 km²). The percentage of wooded areas and the percentage of wooded/habitat areas were calculated. Correlation and regression analyses were used to determine the effect of environmental variables on hunting yield. The results confirm that the hunting yield in different regions is related to the environment and that the percentage of wooded areas is a better predictor of wild boar hunting yield. Also, young wild boars (cub) are more common in wooded areas and older wild boars are more common in grassed areas. The models of hunting yield from the 15€ range were developed for the entire hunting area and for wooded and grassed areas separately. These models can be useful tools for e.g. the evaluation of hunting yield and the management of wild boar populations. However, habitat population relationships should be carefully investigated concerning the possible hunting yield modifications from management as a consequence of forest management.