

## Evaluation on management of wild boar (*Sus scrofa* L.) population in Bolu-Sazakici hunting ground

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**Abstract:** Bolu-sazakici sample hunting ground covered 9132 ha divided into 360 sample areas of 25 ha each. 50 of them were sampled by means of the simple random sampling method. In the sample areas "Point Counts" was applied and the population of wild boar density and numbers were determined. As a result, it was estimated that 734 wild boars inhabit the area. Of these individuals, 79 were males, 238 were females and 417 were piglets. The wild boar density in the area was determined as 8.03 individual 100 ha<sup>-1</sup>. In this paper, first of all, the density of wild boar population was determined by the point counts method, then it was tried to evaluate its management for Bolu-sazakici sample hunting ground.

**Key words:** Hunting ground, Wild boar, Point counts, Management

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### Introduction

The hunting grounds (game reserves) were known as areas preserved by the European kings and nobles to hunt game animals (deer, boar and roe deer *etc.*) about 1000 yrs ago (Eagles *et al.*, 2002). The Ottoman Empire also had hunting grounds where the sultans hunted and organized hunting parties. Kagithane, Sariyer, Belgrad villages, the vicinity of the lake Terkos, Alemdag, Silivri and Catalca are examples of such sites used as hunting activities in Istanbul in Turkish history (Mol, 2006).

The establishment of private hunting grounds in Turkey goes back to the 1980's (Safak, 2003). However, understanding that hunting tourism is a big source of income in recent years, the establishment of new hunting grounds has gained a great momentum recently in Turkey.

According to the Turkish 4915 numbered Law of Land Hunting "hunting grounds are the areas which are naturally inhabited by game and wild animals or where they are subsequently introduced." There are four types of hunting grounds in Turkey : 1) private hunting ground, 2) state owned hunting ground, 3) common hunting ground, and 4) sample hunting ground. Sample hunting grounds which are reserved among the state owned hunting grounds. Common hunting grounds are operated according to the criteria set by the Ministry of Environment and Forestry. The establishment, management and control of the hunting grounds in Turkey are regulated by the principles of "Regulation concerning of the Principles and Procedures of Establishment, Management and Control of the Hunting Grounds". According to the regulation, the

management, operation of the state owned hunting grounds and common hunting grounds are carried out by the Provincial Directorate of Environment and Forestry. Sample hunting grounds are managed by the game manager who has provided minimum adequacy conditions and technical and administrative contract which is determined by the General Directorate of Nature Protection and National Parks. Likewise, private hunting grounds also are managed by the game manager.

According to the mentioned regulation, sample hunting grounds are created at the areas bordered by the General Directorate of Nature Protection and National Parks in the state owned hunting grounds and common hunting grounds for the species with enough population density according to the pre-study and inventory studies. According to the same regulation, the sample hunting grounds must be at least 3000 ha for the game mammals and 1000 ha for the game birds.

Two types of practice are available in the hunting grounds. The first one focuses on animal husbandry under human control for obtaining yield. The second one focuses on the wild game animals (Caughley and Sinclair, 1994). The sample hunting grounds established in Turkey are within the scope of the second practice.

Although regulation of hunting ground by law in Turkey goes back to the Ottoman Empire (Batmaz *et al.*, 1999), the wildlife management concept started to develop in Turkey quite recently. Wildlife management focuses on the determination of the density of the wild animals.

Correct estimation of the wildlife populations' density is the first step to be taken within an effective protection and management plan (Timock and Vaughan, 2002). In management of the hunting ground, it is important for the wildlife manager to know about the stock he has and how he can make use of such stock. After determining the number and density of the wild animals in the hunting ground, a certain quote is given for the animals which are valuable as hunting animals such as wild boar, deer, wild sheep and wild goat. In this paper, first of all, the density of wild boar population was determined by the point counts method, then it was tried to evaluate its management for Bolu-Sazakıci sample hunting ground. Thus regular hunting of these species may be allowed.

### Materials and Methods

Sazakıci sample hunting ground is subordinated to the central county of Bolu Province. It is bordered with the stream Kocasu, the Mount Muradin, the Bakacak hill in the west, Karamanlar, Ulumescit villages, Sigindi quarter and the Mount Yanik in the south; Hasanallar quarter, Hamzaköy quarter, Mutatlar quarter, the Hamancık

hill in the east, and the stream Caysuyu, Civcivler quarter, Islamlar quarter, the Erenler hill, Camlik hill, Koygozuken hill in the north (Fig. 1). The total area of sazakıci sample hunting ground is 9132 ha.

The main plant species determined in the study area include Austrian pine (*Pinus nigra*), scots pine (*Pinus sylvestris*), fir (*Abies bornmülleriana*), beech (*Fagus orientalis*), oak (*Quercus* spp.), hombeam (*Carpinus betulus*), european aspen (*Populus tremula*), lime (*Tilia tomentosa*), maple (*Acer campestre*), ash (*Fraxinus excelsior*), oriental plane (*Platanus orientalis*), walnut (*Juglans regia*), hazel (*Coryllus avellana*), rhododendron (*Rhododendron ponticum*), european holly (*Ilex aquifolia*) and *Rhus* sp.

The area is rainy during all seasons and features sea temperature characteristics. When the formula Köppen and Thornhwaite are applied, compared to the other climate types (Eastern and central Black sea region climate types), the less rainy western Black sea region climate type is dominant in area (Erinc, 1996; Ozyuvaci, 1999). For 71 years, the annual mean temperature is 10.2°C, the highest temperature is 39.4°C and the

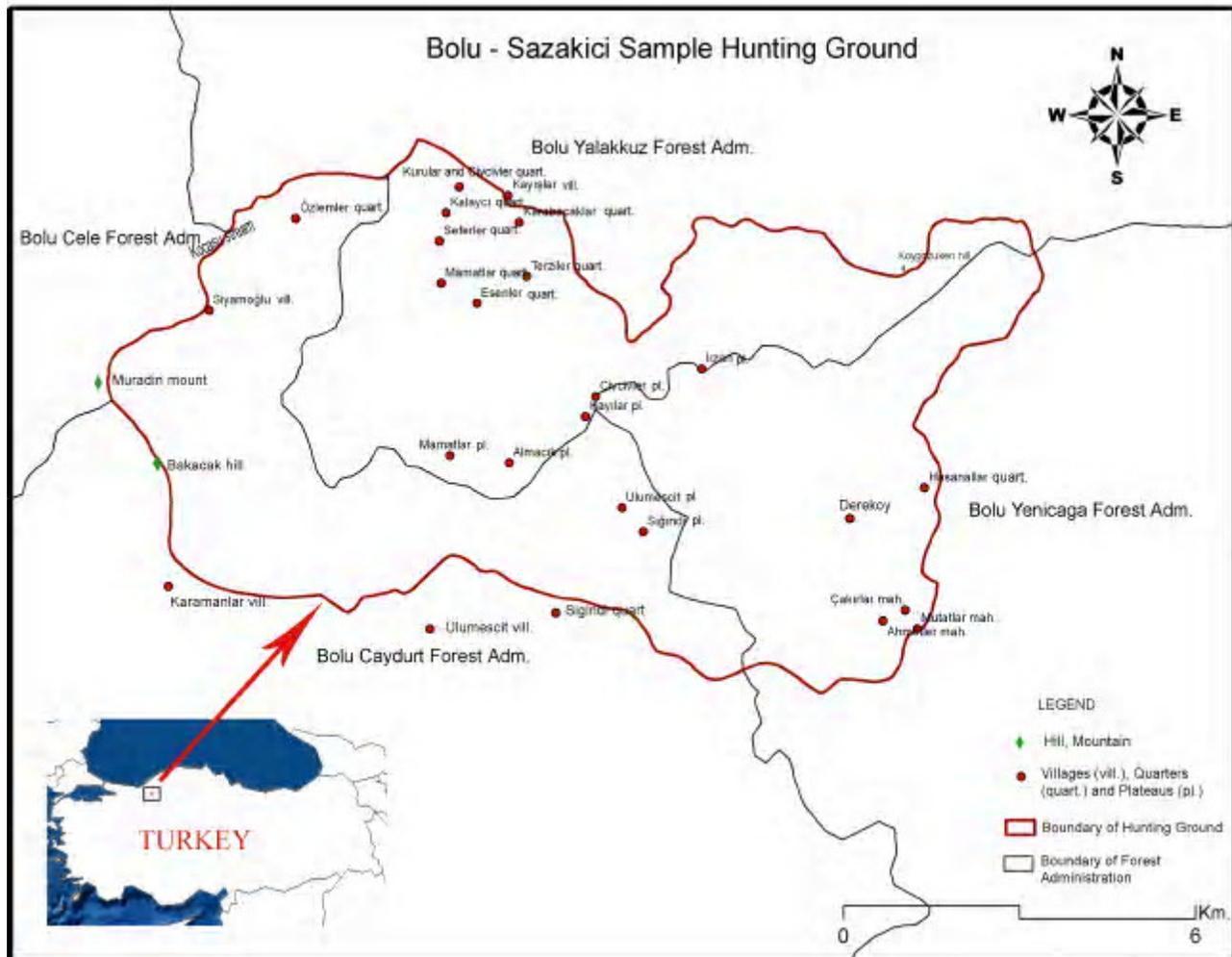


Fig. 1: Bolu-Sazakıci Sample Hunting Ground

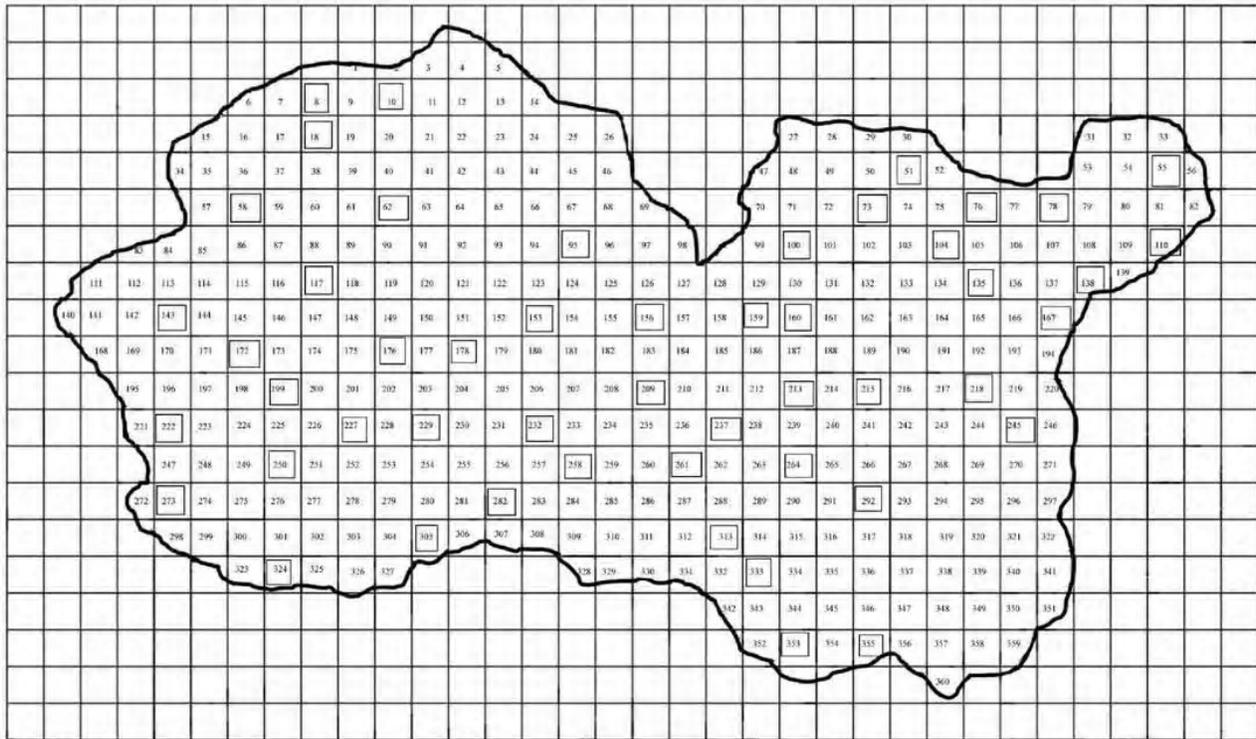


Fig. 2: The distribution of Sample areas in Bolu-Sazakici Sample Hunting Ground

lowest temperature is 34°C and the annual mean precipitation is 536 mm.

Before starting the work in study area, the maps of the hunting ground scaled 1/25000 were collected from Bolu Regional Forestry Directorate, and the borders of the area and grid system were copied on tracing paper. Then, the grids of 100 ha each were divided into four and sample areas of 25 ha were obtained. Thus, 360 sample areas, which total 9000 ha, were gained. The sample areas were numbered from 1 up to 360, and the margins on the edge of the maps were not numbered since they were just included in the 25 ha large areas (Fig. 2). After determining 50 sample areas through the use of simple random sampling method, an observation site was set in every sample area. The procedure for setting the observation site was carried out with the help of the local people and hunters who know the area quite well. In determining the observation site, care was taken to set places which are the passage routes of the wild boars with a good angle of viewing. In order to avoid recurrent counting at the neighboring observation sites: Neighboring sample areas were counted at the same time. The wild boars passage times, passage and destination directions of the animals were recorded.

In this study, for the determination of density of wild boar population in Bolu-sazakici sample hunting ground, the “point counts” method was applied. The principle of this method is based on counting

by waiting at vantage points where the animals regularly pass through such as banks of streams, passages, paths and roads (Ogurlu, 1996). Point counts were carried out in Sazakici sample hunting ground from 7 April to 13 April 2004. During the counting procedure, 5 teams consisting of 2 people each were formed. Within the scope of the study, the observations were carried out twice a day, between 05.00 and 07.30 in the morning and 18.00 and 20.30 in the evening. Thus 10 sample points were counted in a day and the counting studies were completed in 6 days at all sample areas.

Knowing the female, male and piglet number and ratios in the management of the hunting ground is of significant importance in determining the stock to be hunted and making the management plan of the hunting ground. Therefore, it was required to estimate the number of males, females and piglet living in the area. The determination of the sex of wild boars in the entire sampling area, the morphological and behavior features of the boars were observed subtly. In general, the wild boars roam alone outside the rutting period; the females, young males and piglet boars roam as a group (Hus, 1974; Demirsoy, 1995; Graves, 1984; Turan, 1984).

In the study, the data collected from the area were analysed by Descriptive Statistics. To estimate wild boar density the following formulas were used. The standard error was estimated by SPSS 11.0. When the population is infinite and the selection is done without

**Table - 1:** Descriptive statistics of the wild boars in Sazakiçi sample hunting ground

Number	50
Mean	2.04
Standard error of mean	0.495
Standard deviation	3.499
Variance	12.243
Range	15
Minimum	0
Maximum	15
Sum	102

**Table - 2:** The estimated number and ratios of wild boars in sazakiçi sample hunting ground

Wild Boar	Estimated number	Ratio (%)	95% Confidence Interval	
			Lower bound	Upper bound
Male	79	10.76	37	121
Female	238	32.42	115	361
Piglet	417	56.81	168	668

replacement is multiplied by  $\sqrt{\frac{N-n}{N-1}}$  the (finite multiplier) (Kalipsiz, 1994; Orhunbilge, 2000).

For arithmetic mean  $\bar{x} = \frac{\sum_{i=1}^n x_i}{N}$  was used (Kalipsiz, 1994; Orhunbilge, 2000).

Since the number of sample units is  $n \geq 30$ , the estimation of the population's total value:

$\sum_{i=1}^N \hat{x}_i = N \bar{x} \pm Z_{\alpha/2} N \hat{\sigma}_x \bar{x} \sum_{i=1}^N \hat{x}_i$ , (lower bound)  $\leftrightarrow \sum_{i=1}^N \hat{x}_i$ , (upper bound) (Orhunbilge, 2000).

The estimated size of the population is  $\hat{N}$  and the area occupied by the population is A. To estimate the density of the wild boar  $D = \hat{N} / A$  formula was used (Williams et al., 2002).

### Results and Discussion

In the study, 50 of the 360 sample areas were scanned and totally 102 boars were observed. Out of these 11 were male, 33 female and 58 were piglets. The male – female ratio was determined as 1/3. During the study, in Sazakiçi sample hunting ground, roe deer (*Capreolus capreolus* L.), badger (*Meles meles* L.), fox (*Vulpes vulpes* (L.)), bear (*Ursus arctos* L.), wolf (*Canis lupus* L.), european hare (*Lepus europaeus* L.), Marten (*Martes* sp. L.) were also encountered.

It was observed that the damage caused by the wild boars was intensified in the agricultural area around the hunting ground. Also, the local people complained about the damage caused by the wild boars to the agricultural products. Hunters interviewed in the field stated that the wild boars migrated to the north where the chestnuts or masts production are much more plentiful than the study area and where the snow is less thick

during the winter. The data gained was subjected to descriptive statistics and the results were given in Table 1.

The standard error of the mean pertaining to the Sazakici sample hunting ground is 0.495.  $\sqrt{\frac{360-50}{360-1}} = 0.459$

The number of the wild boars in Sazakici Sample Hunting Ground, according to 95% confidence interval, was estimated as  $N_{\hat{X}} = N[\bar{x} \pm Z_{\alpha/2} \hat{\sigma}_x] = 360 * [2.04 \pm 1.96 * 0.459] = 734 \pm 324$ .

According to the data obtained, the estimated number and ratios of male, female and piglet boars are shown in Table 2.

The density of the wild boar population in Sazakici sample hunting ground per 100 ha is as follows;

$$D = \hat{N} / A$$

$$= 734 / 9132 \times 100 \text{ ha}$$

= 8.03 individual 100 ha<sup>-1</sup> and wild boar density for age and sex classes were estimated as follow:

$$D_{\text{Male}} = 0.87 \text{ individual } 100 \text{ ha}^{-1},$$

$$D_{\text{Female}} = 2.60 \text{ individual } 100 \text{ ha}^{-1}.$$

$$D_{\text{Piglet}} = 4.56 \text{ individual } 100 \text{ ha}^{-1}$$

The wild boar population density was estimated at 8.03 individuals 100 ha<sup>-1</sup>. According to Leaper et al. (1999), given the densities of wild boar observed in European studies, it was suggested that it will be reasonable to expect maximum wild boar densities in Scotland of 3-5 individuals 100 ha<sup>-1</sup>. Although 57% of wild boar density belonged to piglets in the study, it seems that the population density of male and female wild boar in Sazakiçi Hunting Ground has already reached the carrying capacity and is quite high according to Leaper et al. (1999) acceptance.

The wild boars give birth to litters from the end of February to the beginning of March (Turan, 1984; Demirsoy, 1995). Since the inventory in Bolu-Sazakiçi sample hunting ground was taken place in April, the number of piglets appeared to be high. However the mortality rate of piglets' amounts to 31% for males and 26% for females, the mortality rate of yearlings reaches 77% for males and 62% for females (Fruzinski, 1995). The sex ratio among the individuals in their natural habitat is 1:1 (Leopold, 1933). The fact that the female to male ratio appeared high as 3:1 in our study may be because the young male individuals were more commonly hunted in the field or the mortality rates are higher in the males than the females after birth.

In our country, the big game mammals that are allowed to be hunted are the scope of hunting tourism. In spite of the fact that the wild boar population in the study area is dense and the damage caused by the wild boars to the agricultural areas around hunting ground is too high, it is important to protect the reserve population. The wild boars are omnivorous (Leaper et al., 1999) and because they eat insects and mice etc. and detrimental organisms (Schley,

2000; Mol, 2006), As long as they don't exceed the carrying capacity in the habitat, they will help the ventilation of the soil, cover the tree seeds with soil and benefit the forestry more than they damage it (Mol, 2006). Also in the sample hunting grounds recently established or to be established, it is important to breed wild boars in order to ensure the natural reserve in these grounds does not suffer from extinction while the hunting of the population is allowed.

The sample hunting grounds are established just for the hunting of wild boars. However, there aren't farms to produce game mammals in Turkey. Companies which rent the hunting grounds aren't allowed to establish facilities to breed wild boar or to produce other big game mammals. All these factors reduce the hunting organizations' incomes. Thus, hunting organizations avoid renting sample hunting grounds.

The hunting ground owners may be encouraged to breed animals with low population densities, in particular, such as deer and roe etc. and the hunting of the species raised may be allowed when their population reaches at an adequate density. Thus, the generation of the species shall be preserved since they are raised on the hunting ground. For instance, the single directional hunting trend in the hunting ground where only one species is hunted may be terminated and multi-directional use of the hunting ground may be ensured and its potential may be increased.

As known, wild boars migrate to areas full of food during the yrs of low seeds and during the winter (Hygnstrom *et al.*, 1994). According to Bruinderink and Hazebrook (1995) also, the wild boars migrating activity is correlated with mast availability. The migration of wild boars should be deterred in order to create an environment conducive to hunting during the winter time. Therefore, feeding should be done and care should be taken for trees such as chestnuts, oaks and beech which could feed the animals during the winter while making the management plans of the forest. Also, surrounding the hunting grounds with fence should be allowed.

Wild boars cause great damage to agricultural fields, particularly to maize and potato fields (Mol, 2006; Schley, 2000). While several wild boars are shot at the agriculture fields around the hunting ground every year, the revenue gained from the hunting ground decreases. Detering such killings is of significant importance in terms of efficiency of the hunting ground. Various methods such as exploding sound bombs are tried to keep the wild boars of the fields. Another method may be to install electrical wires in the surrounding of the agriculture fields. Compensating the losses of the farmers would increase the efficiency of the hunting ground.

One of the greatest problems of Sazakıç sample hunting ground is the production of forest products within the site. The fact that the area is also a hunting ground should be taken into consideration when producing such products. Therefore, the forest enterprises within the borders of hunting ground should work in

coordination with the Nature Protection and National Reserves branch and hunting ground manager.

According to regulation concerning the principles and procedures of establishment, management and control of the hunting grounds, although operation of the hunting grounds is transferred to private companies, the state retains the right of operating the forests within the borders of the hunting ground. That deters the hunting ground owner from building some necessary structures on the area in Turkey.

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