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Rodent Species of Sarikum Nature Protection Area

Pınar ÇAM İCİK*¹

Abstract

Sarikum Nature Protection area, located in the west of Sinop Province with the registration of 'nature protection area' and declaration of 'grade 1 natural site area', has a wide variety of ecosystems in which lake, swamp, dune, terrestrial forest and floodplain forestland ecosystems change within short distances. The fact that the region has different life alternatives is very important in diversifying wildlife species. With this study, the rodent species that have distributed in the Sarikum Nature Protection Area have been identified. Field works were carried out between September 2018 and November 2019. Most of the small mammals belonging to order of Rodentia were caught by live catch traps and identified. After the species identification the specimens in the traps were let out to the region which they were captured. In Sarikum Nature Protection Area, a total of ten different rodent species belonging to 3 families, Sciuridae, Cricetidae and Muridae, have been identified. One species, *Sciurus anomalus*, which was one of the Sciuridae family species, could be directly observed. Remaining 9 rodent species were detected by using live catch traps. The most frequently caught rodent species among all was *Apodemus mystacinus* from Muridae family, with a percentage of 23%. The habitat type, where the largest number of rodent species were obtained and observed, were mixed plants and shrub land areas. All of the rodent species identified in Sarikum Nature Protection Area were in LC (wide spread, low risk) category of IUCN (International Union for Conservation of Nature and Natural Resources). Identification of rodent species in Sarikum Nature Protection Area contribute to mammalian biodiversity at the regional level and will enable species-based approach in subsequent studies.

Keywords: Sarikum, Sinop, Rodents, Rodentia

INTRODUCTION

Sarikum Nature Protection Area is an area of 785 hectares within the borders of Sarikum village on Sinop- Ayancık state highway and 20 km from Sinop province. This area has been classified as a "Nature Protection Area" due to the fact that it contains many ecosystems such as sea, coastal,

dune, lake, wetland and forest ecosystems and because of the rich biological variety and resource values in these ecosystems. Sarikum Nature Protection Area has both a Nature Protection Area (NPA) registry and a site notice [1].

When compared with other nature protection areas in our country, Sarikum NPA is very

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different from the others due to its distinct sand topography despite being located in the region with the highest rainfall. Sarıkum Nature Protection Area is in the list of Important Bird Areas (IBA) and there is a bird watching tower in the area [2]. Sarıkum NPA has not been declared as a Ramsar site, although it is an “international wetland” according to the Ramsar Convention criteria, since it is on bird migration routes and it provides breeding and sheltering areas for many different types of bird [3]. Sarıkum Lake and wetland within Sarıkum NPA is one of the most important areas in terms of biological diversity and it is one of the important bird watching areas in the Black Sea Region [4].

Sarıkum Lake and wetland has been formed on the coastal plain between the mountains and the coastline. There are flatlands surrounded by forests in places on the upper parts of the mountains behind the coastal area which is not too wide. There is only one village settlement called Sarıkum village in Sarıkum Nature Protection Area. This is a village of the central district of Sinop province. The 4 km long Sarıkum beach is the longest and the unique natural beach in Sinop. The depth of Sarıkum Lake is between 0.5 and 1 m. The water of this lake has high salinity since it mixes with sea water. Sarıkum lagoon has an area that can be described as a “desert”, which keeps its mobility with northwest winds and which is occupied by coastal dunes. The forest areas around the lake consist of flooded forests formed by broad-leaved trees such as beech, oak and hornbeam. Also there are *Pinus maritima* forests which were later created artificially in the region [5]. Quaternary deposits are common in the West and South of Sarıkum Nature Protection Area which is located in the fourth degree earthquake zone. Plio-quaternary deposits consisting of yellow sands have also been effective in naming the area as ‘Sarıkum (yellow sand) facies’ in geology maps [6]. Figure 1 shows the map with the geographical location of Sarıkum Nature Protection Area.

Rodentia are represented in Turkey with a total of 9 families as Sciuridae, Castoridae, Dipodidae, Muridae, Gerbilidae, Spalacidae, Gliridae,

Hystricidae and Myocastoridae, and 30 genera [7].

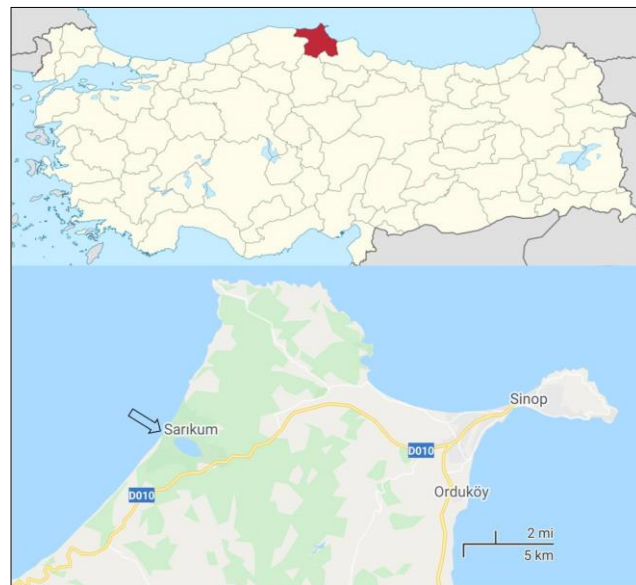


Figure 1 Sarıkum Lake Geographical Location

A total of 5 habitats were determined in which rodent species lived by evaluating the study of Yiğit *et al.* [8]: 1) Semi-arid steppes and plains, 2) Wetlands, 3) Mixed forest and bushes, 4) Coniferous forest, 5) Rocky and stony areas. It has been noted that the habitat type in which grain agriculture is generally carried out is semi-arid steppes and plains and that a large number of rodents are obtained from the areas where this habitat type is dominant [8]. Although Çam and Ölmez (2015) [9] studied the mammal fauna of Sinop province, rodent fauna and the population density of the species in Sarıkum Nature Protection Area have not been evaluated in detail. Also, small mammal species from the specific regions of Sinop province were used for taxonomic studies [10-11], [12]. The mammal fauna in these regions have been specified by a Biodiversity Research within the scope of Sarıkum Lake and Aksaz-Karagöl Wetland Sub-Basins [5] Some observations about the mammal fauna were also presented in the Wildlife Potential and Evaluation report of Ayancık Forest Management Directorate [13]. Some of the mammals distributed in Sinop province have also been listed in the provincial environmental status report of Sinop province [2].

The aim of this study was to identify the rodent species distributed in Sarikum NPA and contributed to taxonomic and ecological studies in this area.

2. MATERIALS AND METHODS

For the identification of rodent species in Sarikum Nature Protection Area, field studies were carried out in a period of 15 months between 2018 and 2019. In the field studies, first the stations were determined, and then observation and trapping studies were conducted. Garmin Etrex 10 GPS (Global Positioning System was used to record Geographical latitude-longitude of the central regions of the stations). In the identification of the species belonging to Rodentia, species-specific nest entrances on the ground were primarily evaluated. Live traps were placed in areas where nests were frequent: above ground, in forests, in dense vegetation and on the border lines of cultivated agricultural land. Both metal and wire traps were preferred to increase species-based preference

Metal traps are based on the system of closing when the animal enters, depending on the pedal system inside the trap. Wire traps, on the other hand, allow the animal to be caught with the closure of the hook by getting free. While the bait was left on the pedal part of the metal trap, it was fixed on the hook attached to the lid inside the trap in wire traps (Figure 2). Metal and wire traps were prepared by leaving peanut butter on bread. The traps were left with open lid on the stations determined in Sarikum NPA when it was about to

get dark. Metal traps can roll depending on wind and other outside influences or they can close before the animal gets in during the day. For this reason, the metal traps left in the field with a stone or a piece of branch on them. In the field studies conducted within the context of this study, a total of 45 traps (35 of them were metal and 10 of them were wire) were used. The traps, which were equally distributed in the land, were collected just after sunrise in the early hours of the next day. Trap collection process was carried out with great care. When it was realized that the lid of the trap was closed, it was opened slowly to take a clear image of the animal which was possibly inside. Sometimes we did not take a photo but observed the specimen. Only for some individuals with small body, there was a chance to take photo when the animal was inside the trap. After the traps were controlled, the species information and the station that they were caught were recorded. Later, the captured animals were released.

Within the context of this study, 72784983-488.04-115954 numbered research permit was taken from the Ministry of Forest and Water Management General Directorate of Nature Protection and National Parks for all field studies to be carried out in Sarikum Nature Protection Area. In addition, this study was approved with 22.05.2018 dated and 2018/01 numbered decision of Sinop University Rectorate Animal Experiments Local Ethics Committee.



Figure 2 a. Baits placed on the pedal of the metal trap b. Baits placed on the hook of the wire trap

Table 1
Rodent species found in Sarıkum NPA, Turkish/English nomenclature, families and IUCN threat categories

Family	Species	Turkish/English nomenclature	IUCN threat category
Sciuridae	<i>Sciurus anomalus</i>	Anadolu sincabı/ Caucasian squirrel	LC
Cricetidae	<i>Microtus levis</i>	Çayır tarla faresi/ East European vole	LC
Cricetidae	<i>Microtus subterraneus</i>	Avrupa çam Sıçanı/ European pine vole	LC
Muridae	<i>Apodemus flavicollis</i>	Sarı boyunlu orman faresi/ Yellow necked field mouse	LC
Muridae	<i>Apodemus mystacinus</i>	Kaya Faresi/Eastern broad-toothed field mouse	LC
Muridae	<i>Mus domesticus</i>	Ev faresi/ House mouse	LC
Muridae	<i>Mus macedonicus</i>	Sarı ev faresi, kısa kuyruklu ev faresi/ Macedonian mouse	LC
Muridae	<i>Rattus rattus</i>	Sıçan, Keme/ House rat	LC
Muridae	<i>Rattus norvegicus</i>	Göçmen Sıçan/ Brown rat	LC
Cricetidae	<i>Myodes glareolus</i>	Kırmızı sırtlı Fare, Kırmızı Fare/ Bank Vole	LC

3. RESULTS

Table 1 shows the species, families, Turkish/English nomenclature and IUCN threat categories of rodents found during field studies in Sarıkum Nature Protection Area.

A total of 10 species belonging to Sciuridae, Cricetidae and Muridae families were found in Sarıkum NPA. These species were systematically classified by Corbet [14], Wilson and Reeder [15] and Kryštufek and Vohralík [16]. All of the species except *Sciurus anomalus*

(Anatolian squirrel) were identified with trapping method. <https://www.iucnredlist.org/> [17] web site was used for IUCN threat categories.

Class: MAMMALIA

Order: RODENTIA

Family: SCIURIDAE Hemprich, 1820

Subfamily: SCIURINAE Hemprich, 1820

Genus: *SCIURUS* Linnaeus, 1758

Sciurus anomalus Gueldenstaedt, 1785 (Caucasian Squirrel) (Direct Observation)

It was observed especially from April to September in the afforested area and open forest areas in Sarıkum NPA. It was observed that the specimens preferred feeding in shrubby areas with mixed plants.

Family: CRICETIDAE G. Fischer, 1817

Subfamily: ARVICOLINAE Gray, 1821

Genus: *MICROTUS* Schrank, 1798

Microtus levis Miller, 1908 (East European Vole) (Trapping)

It was often caught from the border lines of cultivated agricultural land in Sarıkum NPA. It was trapped in shrubby areas with mixed plants though few.

Family: CRICETIDAE G. Fischer, 1817

Subfamily: ARVICOLINAE Gray, 1821

Genus: *MICROTUS* Schrank, 1798

Microtus subterraneus (de Selys Longchamps, 1836) (European Pine Vole) (Trapping)

It was found in traps set in cultivated agricultural land, although not as much as *Microtus levis*. It was caught in a low level in shrubby areas with mixed plants. It was trapped in the parts of flooded forest areas opening to road.

Family: MURIDAE Illiger, 1815

Subfamily: MURINAE Illiger, 1815

Genus: *APODEMUS* Kaup, 1829

Apodemus flavicollis (Melchior, 1834) (Yellow-Necked Field Mouse) (Trapping)

It was obtained from traps set up in terrestrial forest areas, forested areas and dense shrubs. It was the most common species found in trap in the stations, but less number. It was caught from 4 of the 8 stations with 3 different habitat types.

Family: MURIDAE Illiger, 1815

Subfamily: MURINAE Illiger, 1815

Genus: *APODEMUS* Kaup, 1829

Apodemus mystacinus (Danford and Alston, 1877) (Eastern Broad-Toothed Field Mouse) (Trapping)

It is the most common rodent species caught by trap. It was caught from shrubby areas with mixed plants, and from the entrances of forested areas.

Family: MURIDAE Illiger, 1815

Subfamily: MURINAE Illiger, 1815

Genus: *MUS* Linnaeus, 1758

Mus domesticus Schwarz & Schwarz, 1943 (House Mouse) (Trapping)

It was caught outside barns, coops, houses and garages, and the outside of buildings used as

warehouse in Sarikum village in Sarikum NPA. It was trapped in an open area surrounded by mixed plants on one side used as dump.

Family: MURIDAE Illiger, 1815

Subfamily: MURINAE Illiger, 1815

Genus: *MUS* Linnaeus, 1758

Mus macedonicus Petrov & Ružić, 1983 (Macedonian Mouse) (Trapping)

It was trapped in an area surrounded by mixed plants on one side and used as dump, around buildings used as warehouse close to Sarikum village.

Family: MURIDAE Illiger, 1815

Subfamily: MURINAE Illiger, 1815

Genus: *RATTUS* Fischer, 1803

Rattus rattus (Linnaeus, 1758) (House Rat) (Trapping)

It was trapped in areas close to Sarikum village. It was not found in forested areas. It was found on trap in an area surrounded by plants on one side and used as dump.

Family: MURIDAE Illiger, 1815

Subfamily: MURINAE Illiger, 1815

Genus: *RATTUS* Fischer, 1803

Rattus norvegicus (Berkenhout, 1769) (Brown Rat) (Trapping)

It was caught in traps outside houses in Sarikum village. It was not found in open area and forest area.

Family: CRICETIDAE G. Fischer, 1817

Subfamily: ARVICOLINAE Gray, 1821

Genus: *MYODES* Pallas, 1811

Myodes glareolus (Schreber, 1780) (Bank Vole) (Trapping)

It was found frequently in traps set in shrubby areas. It was found in open areas in forest, although lesser relatively.

Traps were set up in 18 of 20 field studies carried out in Sarikum Nature Protection Area. During the field studies, a total of 635 traps were left in the field and rodent species were found in 307 of these. The remaining number constituted the traps in which animals did not enter or those which closed on their own. On some days, on reaching the field to collect the traps, it was realized that the places of the traps had changed. Based on the traces on the ground, it was found that large mammal species had dragged the traps and caused a few traps to become unusable. It was found many times that species which were not members of Rodentia also were caught in traps.

In all of the field studies, in traps, *Microtus levis* species was found 37 times, *Microtus subterraneus* species was found 34 times, *Apodemus flavicollis* species was found 45 times, *Apodemus mystacinus* species was found 71 times, *Mus domesticus* species was found 26 times, *Mus macedonicus* species was found 22 times, *Rattus rattus* species was found 17 times, *Rattus norvegicus* species was found 12 times, and *Myodes glareolus* species was found 43 times. Figure 3 shows the graph created according to the percentages of rodent species caught with traps during the field studies carried out in Sarikum Nature Protection Area. *Sciurus anomalus* species, which was seen frequently in forest areas and dense bushy areas during field studies, was excluded in this graph. The most caught species in the field was *Apodemus mystacinus* from Muridae family with a rate of 23%. The second most caught species was *Apodemus flavicollis*, another species of the same genus, with a rate of 15%. *Rattus rattus* and *Rattus norvegicus* species obtained from Sarikum village settlement area (station number 3) were the least captured species. The reason of this avoiding of *Rattus* species being trapped due to their slightly larger body.

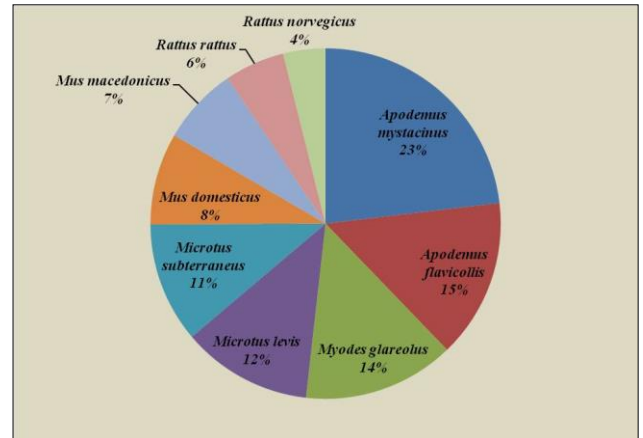


Figure 3 The chart created according to the rodent species' percentage of being caught in a trap

Figure 4 shows images of *Sciurus anomalus* (Caucasian squirrel) species observed frequently which were not caught in trap but which were often observed in forest habitats. Figures 5-7 show images of rodent species which were caught in traps and which were photographed.



Figure 4 *Sciurus anomalus* (Caucasian Squirrel) observed in Sarikum NPA (Photo by: İdris Ölmez)



Figure 5 *Apodemus mystacinus* caught with a trap in Sarikum NPA

(Eastern Broad-Toothed Field Mouse)

Figure 6 *Apodemus flavicollis* caught with a trap in Sarikum NPA Yellow-Necked Field Mouse)Figure 7 *Myodes glareolus* (Bank Vole) caught with a trap in Sarikum NPA

In trapping studies carried out in Sarikum NPA, another small mammal frequently trapped was *Crocidura suaveolens* species (Figure 8). This species is known as garden rats with a pointed nose and belongs to order Eulipotyphla. *Crocidura suaveolens* is a species with a wide distribution.

All of the trappings in Sarikum Nature Protection were planned by taking habitat types and different environments into consideration. Table 2 shows whether the species trapped and observed in Sarikum NPA existed in different habitats were represented by stations.

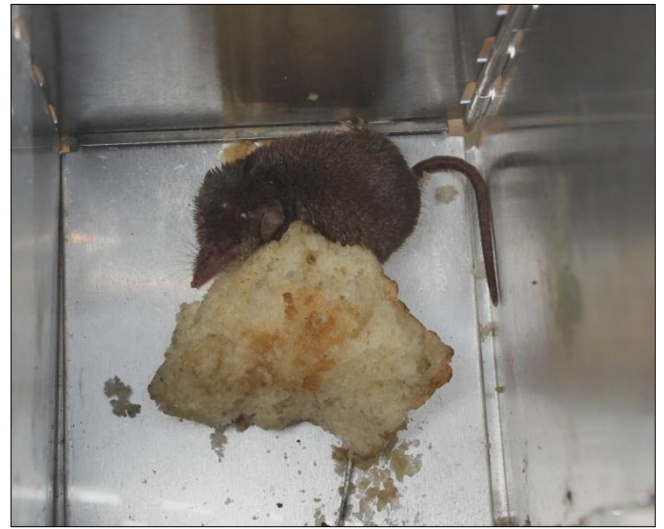
Figure 8 Small mammal *Crocidura suaveolens* (Lesser Shrew) which is not a rodent, but which is frequently trapped

Table 2

Availability of species identified in Sarikum NPA according to habitats

(+: caught/observed in the related habitat; -: not caught/not observed in the related habitat)

	Cultivated agricultural fields, edges of fields	Flooded forest	Sarikum village settlement area	Dune fields	Terrestrial forest areas	Mixed plants and shrubs	Afforested areas (Coniferous forest)
<i>Sciurus anomalus</i>	-	-	-	-	+	+	+
<i>Microtus levis</i>	+	-	-	-	-	+	-
<i>Microtus subterraneus</i>	+	+	-	-	-	+	-
<i>Apodemus flavicollis</i>	-	-	-	-	+	+	+
<i>Apodemus mystacinus</i>	-	-	-	-	+	+	-
<i>Mus domesticus</i>	-	-	+	-	-	+	-
<i>Mus macedonicus</i>	-	-	+	-	-	+	-
<i>Rattus rattus</i>	-	-	+	-	-	+	-
<i>Rattus norvegicus</i>	-	-	+	-	-	-	-
<i>Myodes glareolus</i>	-	-	-	-	+	+	-

The only settlement area within Sarikum Nature Protection Area is Sarikum Village of the central district. A small interview was held with the residents of this village. In this interview, I asked them whether they had to deal or not with rodent species they came across within Sarikum NPA borders at home or in their fields, and whether they used any rodenticide for rodent species. Almost all of the residents in the village remarked that they fed cats in their homes or garden to fight mouse and rat species. They also told that the number of rodent species increased significantly if they did not feed cats in their garden. Most of the residents in the village complained about *Martes foina* (rock marten) rather than rodent species. They said that *Martes foina* got in their coops frequently and killed the chicken, chicks, geese and ducks they fed. Another species they complained about was *Crocidura suaveolens*, one of the Eulipotyphla order, which the people called the pig rat. They told that *C. suaveolens* got in their homes, cut their cables, and that they caught this species in their barns and coops. They remarked that they fought with the *Rattus* species they did not want to see in their homes or around their homes by using sticky traps. They asserted that they did not use any chemicals or rodenticides while fighting rodent species in their agricultural areas.

4. DISCUSSION and CONCLUSIONS

Although the species identified in Sarikum Nature Protection Area were consistent with the rodent species in the study by Çam and Ölmez [9] which was evaluated the mammal fauna in Sinop province, *Dryomys nitedula* (forest dormouse) was not found in field studies conducted within the scope of this study. The habitats in this study were exactly consistent with a study which evaluated the habitats of rodents in Turkey and their effects on agricultural areas [8]. The habitats including the largest number of species contained mixed plants and shrubs. For example, it was observed that the study area including Sinop province where the *Myodes glareolus* (bank vole) samples were collected in a study which allozyme variations were evaluated [12], was terrestrial forestry areas and shrubs with mixed plants with

a rate of 14% in Sarikum NPA. In addition, I found *Crocidura suaveolens* specimens, a species which was evaluated in a study about distribution of it [10], in Gerze district of Sinop and from the banks of Karasu Stream. Although a large number of the same species were observed in the capture studies carried out within the scope of this study, it was excluded from the evaluation because it was not included in Rodentia.

The dune zones of Sarikum Nature Protection Area was very different namely that Rodent species weren't observed or trapped in this zone. The possible reason for this result may be that the nutrients in the dune areas cannot supply the food needs of the rodents. All rodent species were caught/observed in Sarikum NPA were in the IUCN red list under LC (Least Concern), wide distribution, low risk category [17].

In conclusion, this study reveals valuable results in many aspects: (1) this was the first study which Rodentia species in or around Sarikum Nature Protection Area were observed and/or captured; (2) Rodent species which were identified in Sarikum Nature Protection Area constituted about 15% of the 65 rodent species distributed in Turkey. Considering that Sarikum NPA is a 785 hectare area, this rate indicates moderate species richness for Rodentia mammals. To define the wild animals in Sarikum NPA, which was declared as a Nature Protection Area and site, will increase the ecological importance of the region.

(3) During the field studies within the context of this study, I interviewed Sarikum village villagers about the rodent species in this region. The residents of Sarikum village will contribute to the prevention of unconscious struggle with rodents by knowing the rodent species living around them.

(4) The present study is also important in terms of providing a basis for molecular studies to protect the gene resources of Sinop province.

Sarikum Lake, which is one of the ecological values of Sinop province, and its surroundings are visited by many nature lovers and bird watchers.

In my opinion, precautions should be increased to protect the area from anthropogenic effects and to prevent holiday makers using the beach in summer from harming the nature of Sarikum NPA. Warning signs in the area should be increased. Entrances and exits to the area should be controlled more strictly.

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The Declaration of Conflict of Interest/ Common Interest

No conflict of interest or common interest has been declared by the author.

The Declaration of Ethics Committee Approval

The author declare that this study was approved with the 22.05.2018 dated and 2018/01 numbered decision of Sinop University Rectorate Animal Experiments Local Ethics Committee.

The Declaration of Research and Publication Ethics

The author of the paper declare that she complies with the scientific, ethical and quotation rules of SAUJS in all processes of the paper and that she does not make any falsification on the data collected. In addition, she declares that Sakarya University Journal of Science and its editorial board have no responsibility for any ethical violations that may be encountered, and that this study has not been evaluated in any academic publication environment other than Sakarya University Journal of Science.

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