FINAL REPORT

Improving the Management of Coastal Protected Areas and Ecosystems as a Nature-Based Solutions to Climate Resilience and Addressing Climate Resilient Rural Development Issues

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Ankara

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1. Executive Summary

The project ‘Improving the Management of Coastal Protected Areas and Ecosystems as a Nature-Based Solutions to Climate Resilience and Addressing Climate Resilient Rural Development Issues’ is implemented by the World Bank for the client Ministry of Agriculture and Forestry using grant of Climate Change Fund.

This final report summarizes the previous reports on multidisciplinary scientific studies and socio-economic and ethnographic research and the proposed microeconomic rural development plan.

Nature based solutions were first provided by the multidisciplanary scientific analysis in August 2023, however they were revised and extended following the ethnographic analysis in December.

A microeconomic development plan was developed as a set of recommendations. The recommendations for sustainable social and economic rural development of the Sarikum Village, in harmony with the natural conditions of the protected area, are intended to be used in developing the management plan for Sarikum Nature Reserve. With this regard, not only increasing the climate resilience but also sustainable use of biodiversity is addressed in the recommendations.

The set of recommendations also addresses the vulnerable and disabled groups, in particular elder women, and girls. The sustainable rural development model recommendations can be grouped into the following four main categories:

1. Sustainable Jobs and Livelihoods
2. Sustainable Use of Biodiversity
3. Pathway to net zero carbon emissions and adaptation to climate change for a livable future of Sarikum
4. Increased Access to Market and private sector development

Finally, as the last deliverable of the project a small climate change museum is established in the Sarikum Protected Area and a training was organized for students.

2. Project Background and Objectives

Türkiye is endowed with a wealth of coastal natural capital but suffers from multiple natural hazards. Turkish peninsula is surrounded by four different seas (i.e., the Mediterranean Sea, the Black Sea, the Aegean Sea, and the Sea of Marmara), constituting an 8333-km-long coastline. Although coastal cities cover less than 5% of the total surface area of Turkey, they comprise 51% of the population, 80% of industrial activities, and 90% of tourism income[1]. Coastal ecosystems provide critical habitats for different species and a wide range of ecosystem services (e.g., flood mitigation, water purification, climate regulation, carbon storage, food provisioning, and cultural heritage). However, the coastal areas of Türkiye suffer from a range of natural hazards (e.g., sea-level rise, flood, earthquake, wildfire, and tsunami) and are at high risk of negative socio-economic impacts.

Türkiye's coastal ecosystems are increasingly threatened by climate change and anthropogenic stressors, **which further impacts local communities**. Climate projections indicate that the number of days with a maximum temperature above 37 degrees will increase everywhere in the Mediterranean region, with a doubling in Türkiye from 30 to 60 by 2050[2]. It is estimated that drought conditions could prevail for at least six months out of every year in Türkiye. Warming temperatures and ocean acidification are reducing the resilience and function of the coastal ecosystems. Local communities that rely on agriculture and tourism will be significantly affected. At the same time, human pressures make the coastline even more vulnerable. Development in tourism, industry, and urbanization adds further stresses to the ecosystem through waste and wastewater pollution and land-use change. Landscapes including cliffs, forests, sand dunes, and the endemic species that live in these landscapes, like monk seal are all negatively impacted[3]. There requires better management and resilience-building in coastal areas to strengthen the climate resilience of the coastal communities and improve the ecosystem services of coastal areas in Türkiye.

Among the coastal areas in Türkiye, Sarikum Nature reserve is a small but valuable protected area where the landscape is hugely diverse, and its biodiversity is prominent and globally important.

This reserve at sea level consists of lakes, forests, pseudomaquiscommunities, coastal dunes, coastal cliffs, wetlands, afforestation areas, agricultural areas and settlements.

[1]Albayrakoğlu E. Climate change and security: the case for Turkey. Gazi Univ. Akademik Bakış J. 2011; 5:59-76.

[2] Woetzel, J., Pinner, D., Samandari, H., Engel, H., Krishnan, M., Marlies, V., & von der Leyen, J. (2020). A Mediterranean Basin without a Mediterranean Climate. McKinsey Global Institute: New York, NY, USA.

[3]Kuvan, Y. (2010). Mass tourism development and deforestation in Turkey. Anatolia, 21(1), 155-168.

It has been designated as an Important Bird Area (IBA) considering that it is a host for a large amount of winter water birds (233 bird species identified so far). It is also an indispensable habitat for a wide range of animals (e.g., lizard[4], snake, turtle, butterfly, wild boar, jackal, fox, marten, squirrel and roe deer) and endemic species (e.g., *Heracleum playtytaenium*, *Taraxacum revertens*, *Verbascum hereobarrbatu*, etc.[5]).

The livelihoods of Sarikum villagers depend on coastal and forest ecosystems and are receiving negative impacts from pandemic, climate change, and poor management. Between 2016 and 2020, Sarikum saw a steady increase in the population (from 145 to 155) with relatively more males than females (gender ratio 1.09) (**Figure 1**). The Livelihoods for the villagers include tourism, fisheries, agriculture, husbandry, many of which rely on coastal and forest ecosystem services (e.g., collecting mushrooms is a common livelihood for women). However, since the pandemic, the population has dropped in 2021, along with a decline in economic growth. On 22nd October of 2020, the entire village was quarantined for 14 days. The general economic effect of the pandemic to the villagers was the decrease in tourism income. One restaurant in the village is also heavily affected by the pandemic. Furthermore, the area is prone to flood whose frequency and impact can be increasingly severe with climate change over the next decade[2]. Some key management problems include the shortage of infrastructure, lack of legal regulation of ecotourism, and insufficient institutional capacity[6] further increase the vulnerability of the local community. For example, the excessive husbandry of sheep and goats has led to overgrazing of the forest area. Current beach tourism also poses very negative effects on the dunes and coastal ecosystem. More sustainable use of the area should be planned and the possibility of alternative beaches should be explored.

[4]Dincaslan, Y. E., Tosunoglu, M., & Gul, C. (2013). Herpetofaunal inventory of the Sarikum Nature Reserve (Sinop, Turkey). Herpetozoa, 26(1-2), 96-97.

[5]Sivaci, E., Yardim, Ö., Gönülol, A., Bat, L., & Gümüş, F. (2008). Sarikum (Sinop-Türkiye) Lagününün Bentik Algleri. Journal of Fisheries Sciences, 2(4), 592–600. doi:10.3153/jfscom.2008022.

[6]Öztürk, S. (2015). Determining management strategies for the Sarikum nature protection area. Environmental monitoring and assessment, 187(3), 1-9.

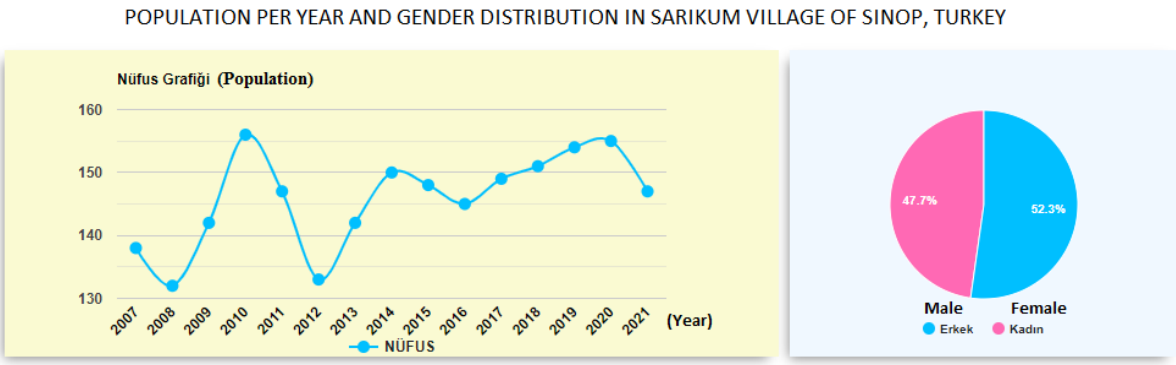


Figure 1. Population per year and distribution of gender in Sarikum Village

This project, implemented with the Ministry of Agriculture and Forestry of the Republic of Türkiye, aims to **strengthen integrated coastal management and increase access to improved livelihood opportunities and resilient infrastructure services for rural communities** in the Sarikum Nature Reserve and Sarikum village in Sinop city of Türkiye. The Project has 4 main components: 1) Social and scientific analysis as a basis for guidance 2) Climate-resilient rural/local development as part of COVID19 recovery based on a sustainable microeconomic model 3) Certified training and raising awareness as part of COVID19 recovery 4) Technical assistance for policy development and rural greening. It will complement the *Türkiye Resilient Landscape Integration Project (TULIP)* (which is an investment project financing to strengthen integrated landscape management and increase access to improved livelihood opportunities and resilient infrastructure services for rural communities in targeted areas of Türkiye) but with more focus on strengthening the management of the coastal region for improved ecosystem services and resilient livelihoods.

One of the key expected outcomes of this project is to strategically use, value, and protect the coastal ecosystems in Türkiye which have a critical role in climate change adaptation. According to climate modelling, Türkiye is expected to witness more intense rainfall, more frequent floods as well as heatwaves, and drought in the coming decades. On one hand, coastal ecosystems are indispensable in mitigating the impacts of natural hazards and sustaining local livelihoods. For example, wetlands provide a buffer to protect settlements from storm surges, with the world-wide annual dollar value in this protection service measured in trillions. On the other hand, mismanagement of these ecosystems can result in devastating impacts on communities in the long run.

For example, the Ramsar Scientific and Technical Review Panel estimates the world's wetlands currently contain 35% of global terrestrial carbon, which if not managed properly would result in huge carbon emissions. Türkiye's development, especially in the agriculture sector, cannot be sustainable without understanding and incorporating ecosystem services into development planning. Protecting and managing coastal ecosystems in Sarikum area as a nature-based solution (NBS) is a critical step to strengthen the resilience of local communities to climate change.

With this regard, the current consultancy seeks to provide technical assistance studying the status and function of the coastal ecosystem in the Sarikum area, its impacts on local communities, and potential strategies to strengthen its ecosystem services. **The main objective of this consultancy is to support policy formulation by Directorate General of Nature Conservation and National Parks (DGNCNP) through the following:**

- A multidisciplinary analysis of the region with regards to biodiversity and ecosystem services,
- Ecosystem accounting of the Sarikum village and areas with no current valuation,
- Soil analysis, and collecting limnologic and paleoclimatic baseline data of Sarikum Lake,
- Social and economic analysis in the Sarikum village for climate-resilient agriculture.

It is expected that the consultancy contributes to the following outcomes:

a. Improved understanding of the status, changes, threats, and potential solutions for biodiversity and coastal ecosystem in the Sarikum region along with a wide collection of baseline data.

b. Guide an action plan for climate change resilient rural development of the coastal villages near protected areas, based on multidisciplinary scientific analysis.

c. Development of a sustainable microeconomic model and behavioral economic theory of change for climate change resilient rural development as part of post COVID19 recovery for villages near coastal areas.

d. Design of exhibition and training for the new Climate change museum in the building of DGNCNPs for all visitors, and in particular for the training of students in all Sinop city on climate change resilience and nature-based solutions.

3. Summary of Multidisciplinary Scientific Analysis

The field studies were carried out according to the following calendar (**Table 1**).

Table 1. Calendar of Field Studies

Discipline	Dates	Annex
Zoology	26-27 January 2023 26-27 May 2023	Annex 5 and Annex 7
Pollination	26-27 January 2023	Annex 6
Limnology	26-27 January 2023	Annex 8
Soil Science	26-27 January 2023 26-27 May 2023	Annex 9
Socilogy and Economics	2-16 March 2023	Annex 12
Botany	Not applicable (All is readily available literature from the regional directorate, and all is 2007 data)	Annex 1, 2, 3 and 4

Biodiversity and Ecosystem Services

Combined with Anatolia's complex topography and geomorphology, Türkiye's location at the junction of three continents makes it a key country for global biodiversity conservation. These geographical features account for a great variety of habitats and species, particularly, exceptionally rich flora. With nearly 9,000 species of vascular plants and ferns, Türkiye has the richest flora of any country in the temperate zone, with a level of endemism of almost 34% (3500 species).

The primarily straight, Black Sea coastline of Turkey is intermittently broken up with distinctive capes like the Sinop peninsula. The Sinop peninsula is made up of two promontories one of which marks the northernmost point of Türkiye. It has local Mediterranean climate patterns and houses enclaves of Mediterranean micro-climate zones. These micro-climate zones allow unique vegetation to floristic in the area, enhancing the Black Sea region’s biodiversity.

Located on the Sinop peninsula, about 23 km west of Sinop city center, Sarikum Lake and environs exhibit a variety of remarkable ecosystems including marine, intertidal, dune, lake, wetland, as well as terrestrial and flooded ash tree forest and forest ecosystems, all within relatively short distances.

The Sarıkum Lake and surrounding wetland ecosystems, which meet the international wetland standards, shelter a variety of flora and fauna. For example, the area is on the migration route of plenty of bird species and provides both food and refuge for these large bird populations.

Wetlands are sensitive and fragile ecosystems, and it is very important to protect their biodiversity and sustainability. Besides being valuable natural resources, they also serve as outdoor laboratories for scientific studies. Sarıkum Lake and the surrounding area have been declared a "Natural Conservation Area" (NCA) in 1987 by the National Ministry of Forestry for these reasons. The area covers 785 ha., consisting of 102 ha. lake surface, 82 ha. wetlands, 385 ha. forest and 216 ha. open space. It is a unique and special region of Türkiye (IPA-Imported Plant Area) particularly for its floral diversity.

Botanically, the Sarıkum NCA preserves some 522 taxa consist of 328 genera belonging to 97 families. 7 taxa are nonflowering vascular plants. 4 taxa belong to *Gymnospermae***,** while the other 511 *Angiospermae***,** *Dicotyledones* and *Monocotyledones* comprise 411 and 100 taxa respectively.

The richest families as to number of taxa are Asteraceae 9,58 %, (50), Poaceae 6,89 % (39), Fabaceae 5,94 % (31), Lamiaceae, 5,56 % (29), Rosaceae 4,41 % (23) and Caryophyllaceae 3,64 % (19), This family consist of 238 (54,2 %) of all the taxa. The numbers of endemic taxa in the Sarıkum NCA are 14 and endemism rate is 2,68 %. The rate of endemism is low because wet areas are common and there are many cosmopolitan aquatic taxa in these areas.

The regional directorate provided detailed flora (**Annex 1, 2, 3,** and **4**) of the protected area. These are also verified in the field studies. Wildlife and vertebrate fauna (**Annex 5**), as well as invertebrate fauna (**Annex 7**) studies were also carried out using both literature and field studies. However these data are not produced with a management oriented perspective, but rather they are pure science picturing the status of biodiversity in the area.

In this project the client aims to develop a management plan for the protected area. Thus the drivers of change, pressures, status, impacts and responses (DPSIR) are evaluated (**Figure 2**). The abbreviation DPSIR, used by European Environment Agency stands for a conceptual framework in a policy meaningful way (Maxim, Spangenberg, O'connor, 2009).

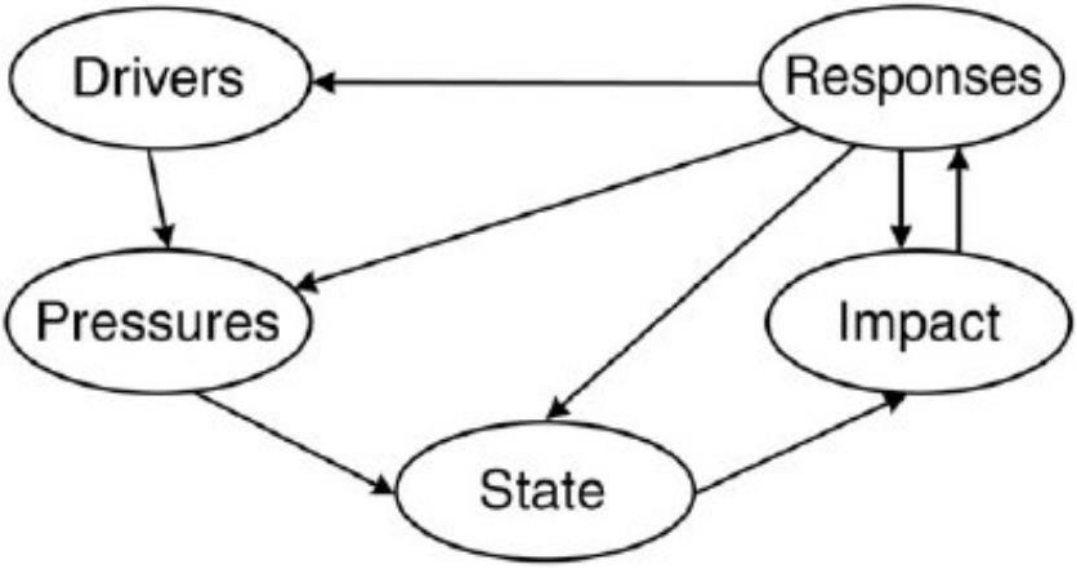


Figure 2. DPSIR Model (Smeets and Weterings, 1999)

The main drivers are anthropogenic factors (tourism, forestry, and traditional livelihoods), natural factors (flood disaster) and climate change. The fishery and agriculture sectors do not represent an important level of driver of change on biodiversity, as only a few houses do agriculture and fishery practices in the area and agricultural area is out of the protected area. However the pesticides used in upper basin can be a future threat for the lake.

The states of biodiversity and ecosystem services are under many pressures. The pressures observed in Sarikum terrestrial ecosystems are pollution on beach, illegal hunting in overall area, overcollection of fungi and illegal logging for fuelwood in the forest, as well unsustainable forestry practices in nearby forests by the State (General Directorate of Forestry). The pressures on Sarikum Lake and its coasts as well as dune ecosystems and marine ecosystems are pollution and flood. Flood itself does not only alter the ecosystem but it also brings additional pollution from the upper basin.

Impact is degradation of biodiversity and ecosystems, as well as loss of ecosystem services. The responses are by government and these include provision of fuelwood to local people to prevent illegal cutting, promoting solar energy to reduce carbon footprint, and protection of the area with a status. However the protected area needs a management plan responding to impacts which will be developed within this project.

Basak et al. (2022) states that in Türkiye, ecosystem services are mostly assessed in “forests and woodlands”,“rural landscapes”, and “urban systems” ecosystem types with shares of 30.4%, 15.7 %, and 11.2 % respectively. Among these ecosystem types, provisioning services were the most evaluated ES, with a share of 36.8 %. Moreover, in line with the spatial distribution of ES studies, “steppes” and “shrublands” were the least studied ecosystems. In this study, forest and lake ecosystems are the main study areas.

According to CORINE-2018, the basin in which the protected area is located, is covered by broad-leaved forest, coniferous forest, mixed forest, transitional woodland and shrubs, beaches, dunes, sands, land principally occupied by agriculture with significant areas of natural vegetation, complex cultivation patterns and salt marshes. All these land covers other than transitional woodland and shrubs exist in the protected area (**Figure 3).**

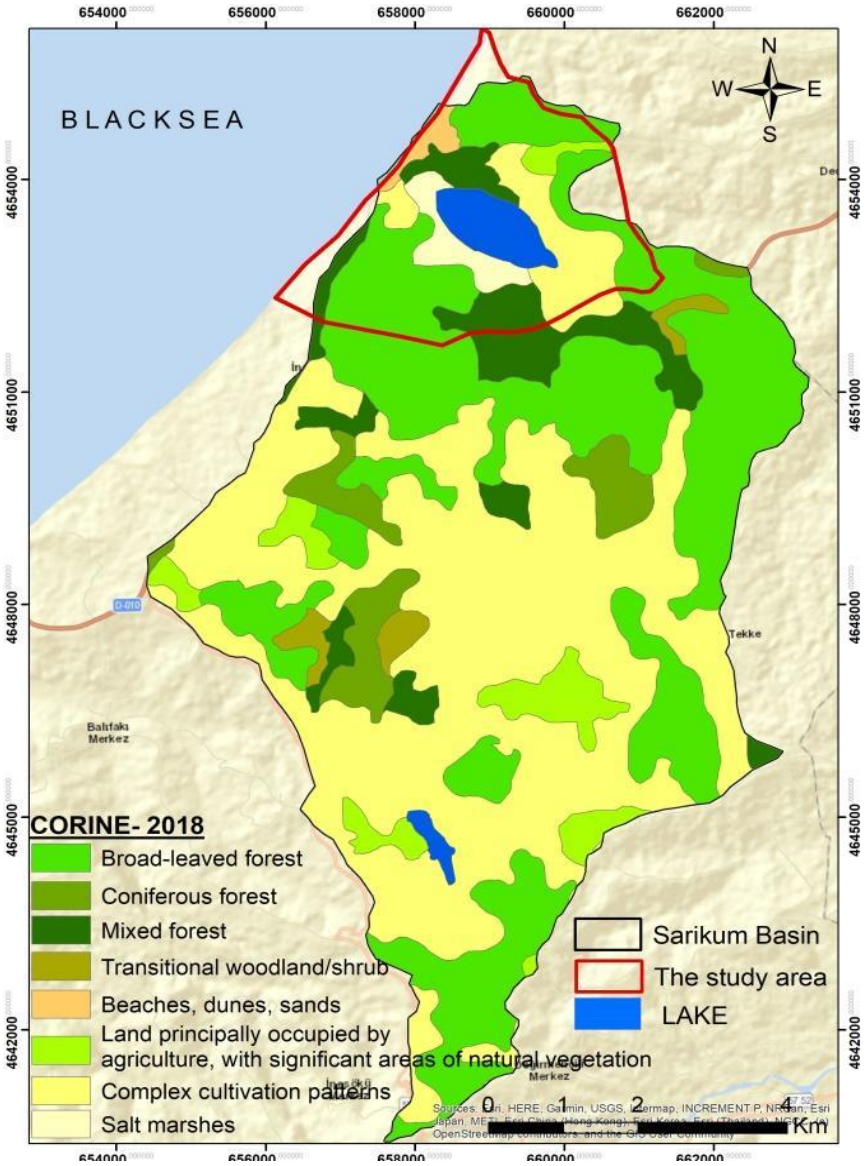


Figure 3. Corine Land Cover Classes in Sarikum

According to the SOC-stock distribution map (**Figure 4**), the amount of soil organic carbon within the borders of the National Park shows a wide distribution between 0.5-ton C ha^{-1} and 118.7 tons C ha^{-1}.

It is possible to say a similar distribution within the soil nitrogen stock distribution. According to the N-stock distribution map, the amount of soil nitrogen stock within the borders of the National Park shows a wide distribution between 0.66 tons N ha^{-1} and 26.61 tons N ha^{-1}.

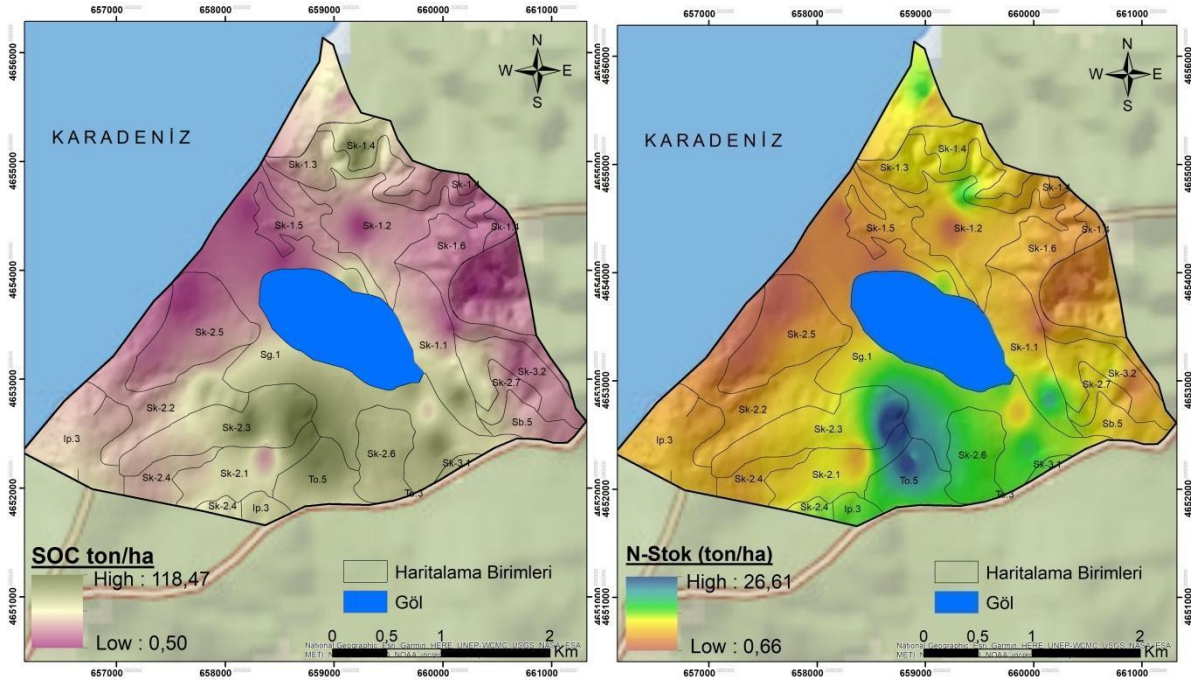


Figure 4. Distribution of SOC-stock and N-Stok maps of the study area

An average of 48 tons of C ha^{-1} 0-30cm^{-1} in the project area falls into the middle level SOC stock class (**Annex 9**).

Limnological and paleoclimatic analysis of some samples from the lake are finished and presented in **Annex 8**.

Pollination accounting (**Annex 6**) is done at district level due lack of statistical data about the village.

The added value of this project will be developing incentives for solar energy and nature based solutions in the management plan, as well as restoration planning.

4. Summary of Ethnographic and Sociological Analysis

During the field studies for the implementation of the project, fieldwork visits to Sarikum Village, interviews and ethnographic research process were finalized in March 2023 by Assoc. Prof. Dr. Aysegul DEMIR, Dr. Assistant Professor Mehmet Samet ERDEM and the staff of the Sinop General Directorate of National Parks, in approximately three weeks under the guidance of Mr. Ümit Durmaz, Sarıkum Mukhtar (local director of village in Turkiye).

Methodologically, the survey conducted in Sarikum village, which represents a small group in accordance with the studies of village sociology, and gives the best result is ethnographic research applied to tribes, tribes and small groups in qualitative research.

Since these studies are conducted for exploratory purposes, the information to be obtained is also in this direction. The research will be analyzed within the framework of qualitative research methods, which constitute the focus of the understanding-based method of the interpretive paradigm. The sample of the research consists of adult individuals over the age of 18 living in the village of Sarikum in Sinop Province. According to the data obtained from the headman's office in the village of Sarikum, there are 49 households that are actively living. Interviews were conducted in a total of 44 households that were suitable for visits. In-depth interviews were conducted with adult individuals over the age of 18 (women/men) living in these households through the socio-economic questionnaire, which was also prepared before in line with the subject and purpose of the project. Visits were made to the households located in Sarikum and interviews were held in the households. The interviews were conducted according to the door number system in the village households according to the appointment system to be taken in advance under the guidance of the headman (Mukhtar). The interviews were conducted in the company of the village headman, again applying for the guidance of the headman. Standard questions were asked for demographic factors and Carbon Footprint, unstructured and exploratory questions were asked for ethnographic interviews. In the research planned on the basis of a focus group interview, interviews were conducted mainly with chats aimed at obtaining information focused on sincerity and trust between the members of the household and the project team. The interview periods have been increased in order to get more detailed information from women individuals in line with the subject and purpose of the project. Ethnographic interviews were also conducted in the research.

The raw data and the details of the resarch is given in Annex 12 and the statistical presentation of the data in terms of histograms, pie charts are documented below in **Figure 5-16**.

Figure 5 shows the data regarding the demographic structure in Sarıkum Village. In the field visits, it is learned that 129 people, 63 women and 66 men, live in the village. The number of individuals under the age of 16 was 13, 7 of whom were girls and 6 of whom were boys. The number of individuals over the age of 16 is a total of 113 people, 51 women and 62 men. The number of children living outside the village of people residing in the village is 86, and this figure is not included in the village population. Finally, the number of people with university education was determined as 17.

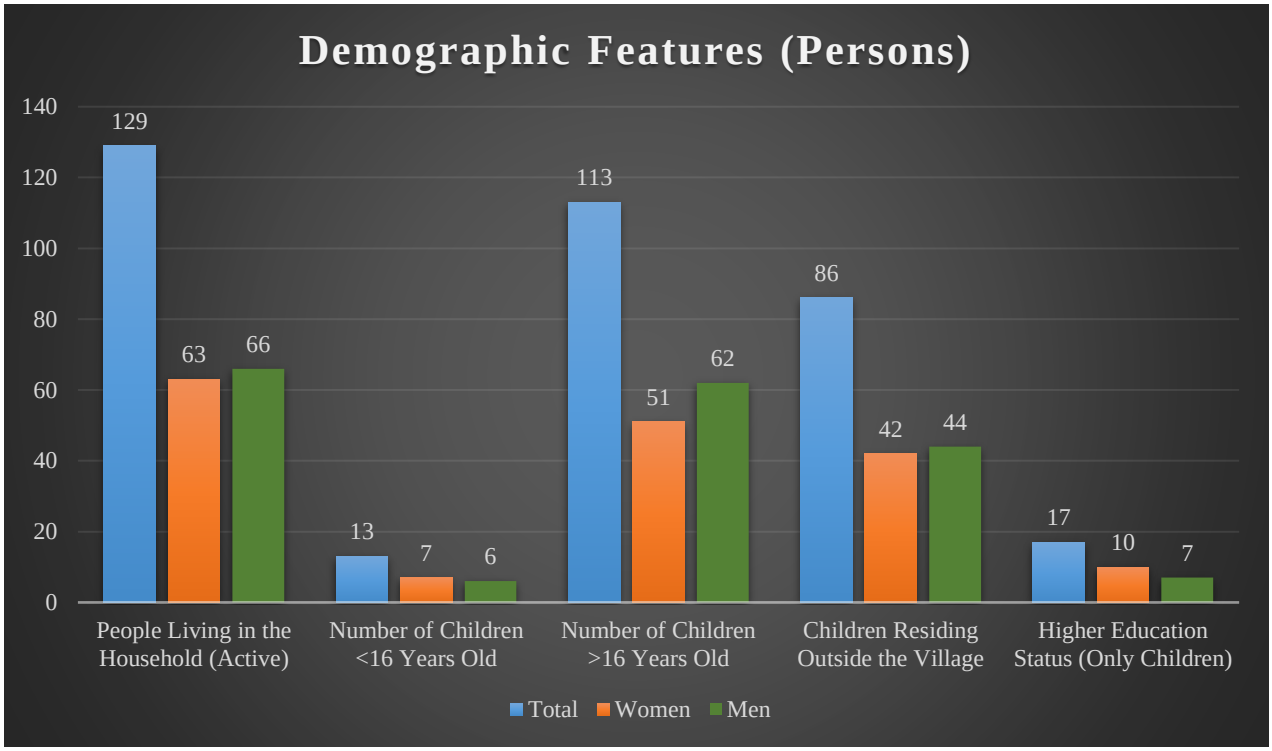


Figure 5. Demographic structure in Sarıkum Village

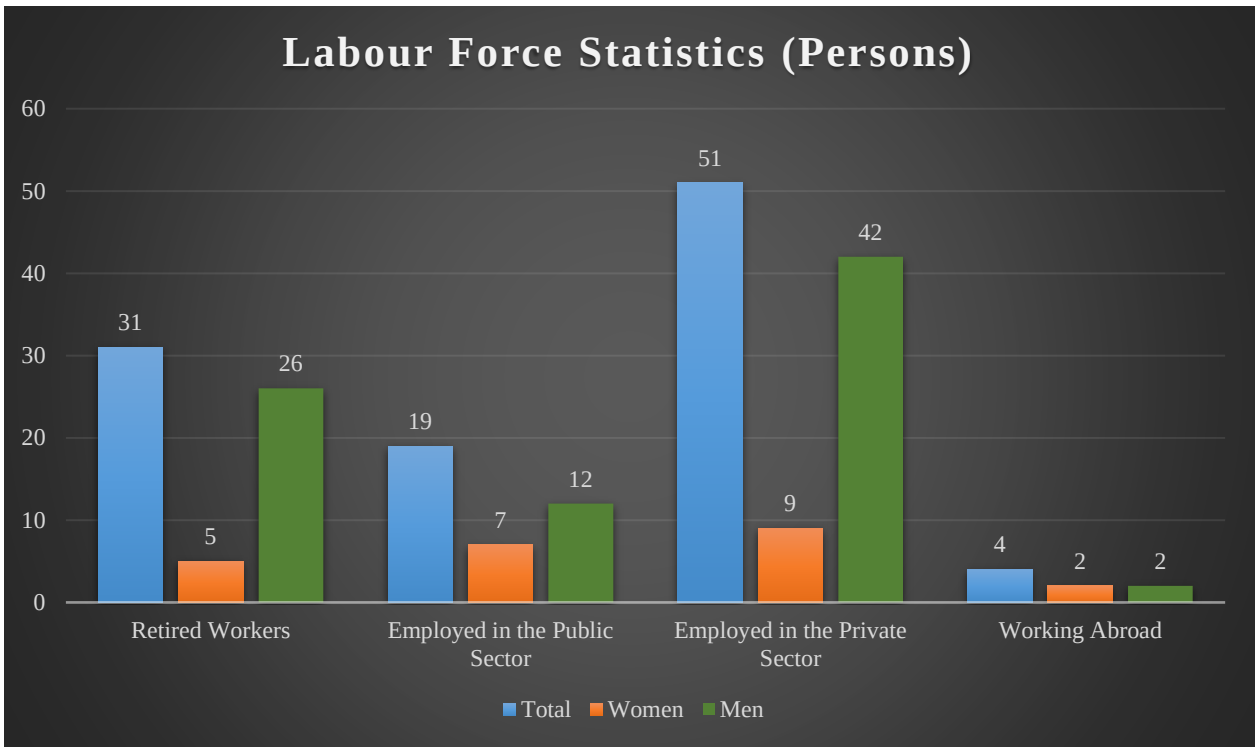


Figure 6. Labour force in Sarıkum Village

Figure 7 shows Livestock Statistics in Sarıkum Village. When we look at the livestock statistics, it is observed that poultry constitutes the majority, and the distribution of small and large cattle is almost equal. In this context, there are 100 sheep, 98 cattle and 272 poultry in the village.

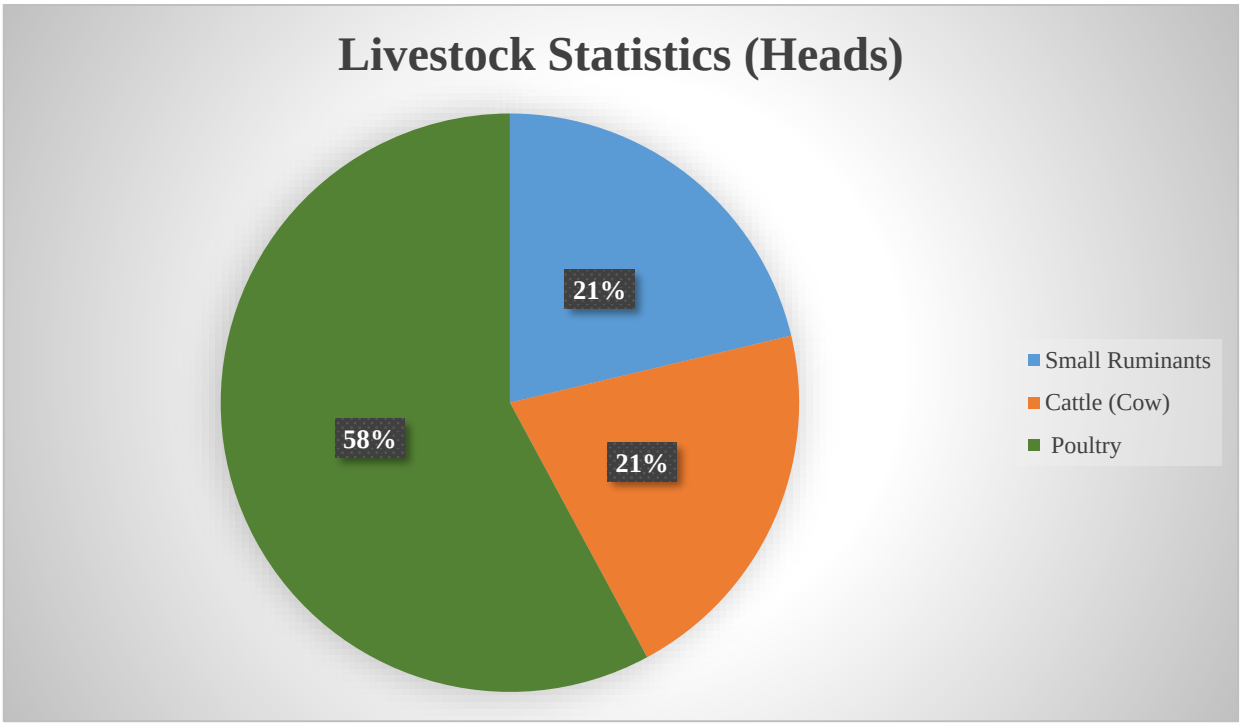


Figure 7. Livestocks in Sarıkum Village (%)

Figure 8 shows the distribution of poultry owned by households in Sarıkum Village. When we look at the distribution of small ruminants, we see that there are 181 chickens, 84 geese, 5 ducks and 2 turkeys. While the chicken population constitutes 66% of the poultry population, the goose population is in second place with 31%. This rate is followed by duck with 2% and turkey with 2%.

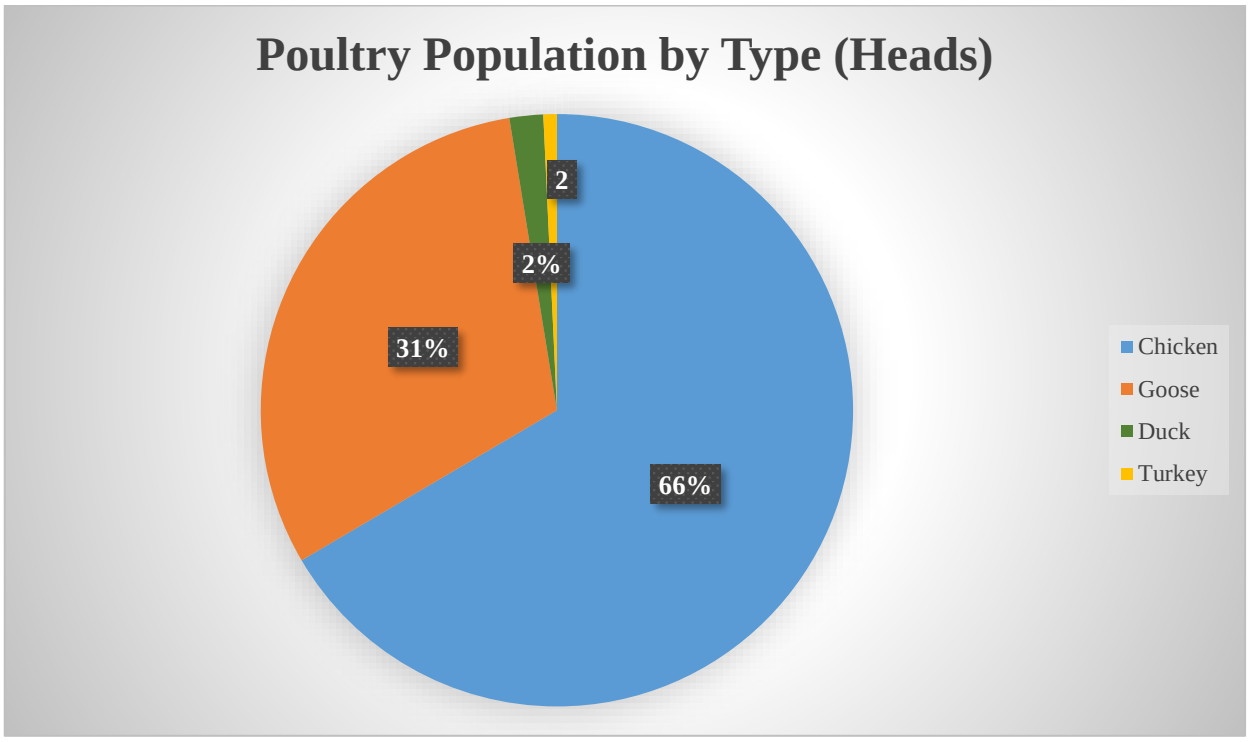


Figure 8. Poultry stocks in Sarıkum Village (%)

Figure 9 shows the distribution of income from livestock in Sarıkum Village per households. In our field studies, it was observed that 7 households earned income from animal husbandry. It was determined that 1 household was intensively engaged in animal husbandry and that it constituted 49% of the income obtained in this context in the village with 20,000 TL per month. It was determined that the other 6 households earned income ranging from 2000 TL to 7000 TL.

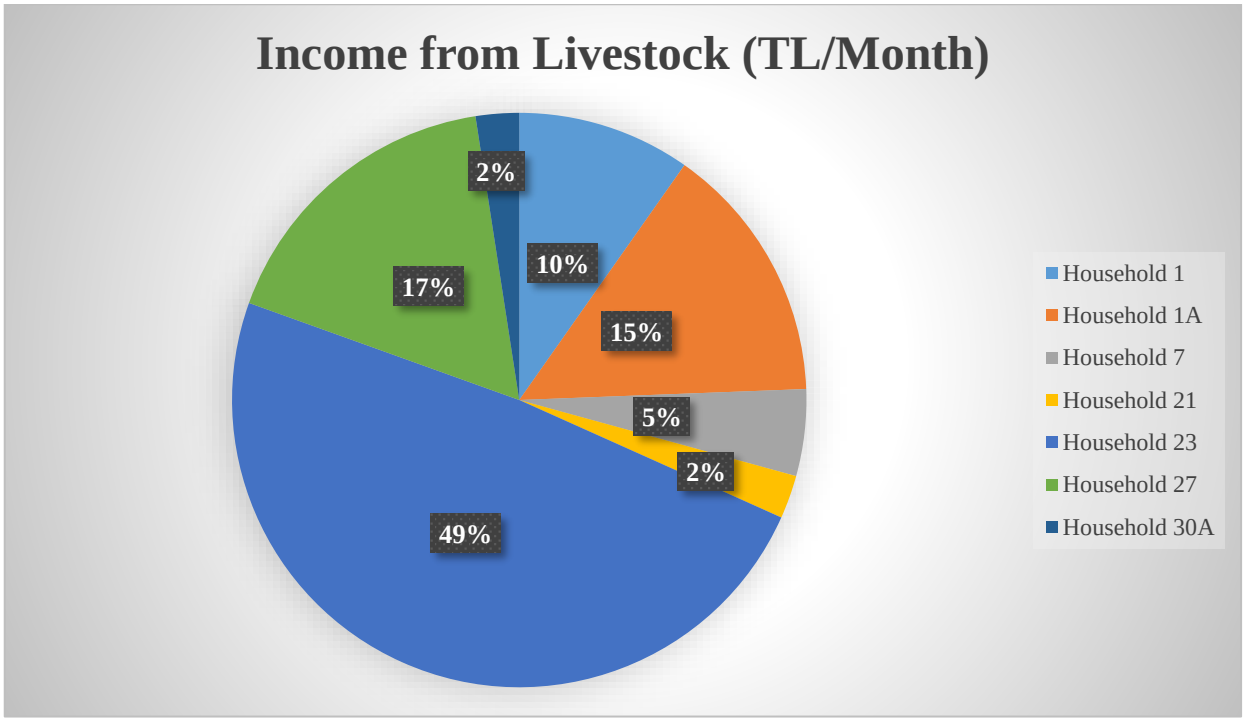


Figure 9. Revenue from livestock in Sarıkum Village (%)

Figure 10 shows the distribution of income from agricultural products by households in Sarıkum Village. According to the data obtained from the field, it was determined that only 3 households earned income from agriculture. These households were observed to earn 500TL, 500TL and 1500TL respectively, and it was observed that a single household earning 1500TL constituted 60% of the income obtained from agriculture in the village.

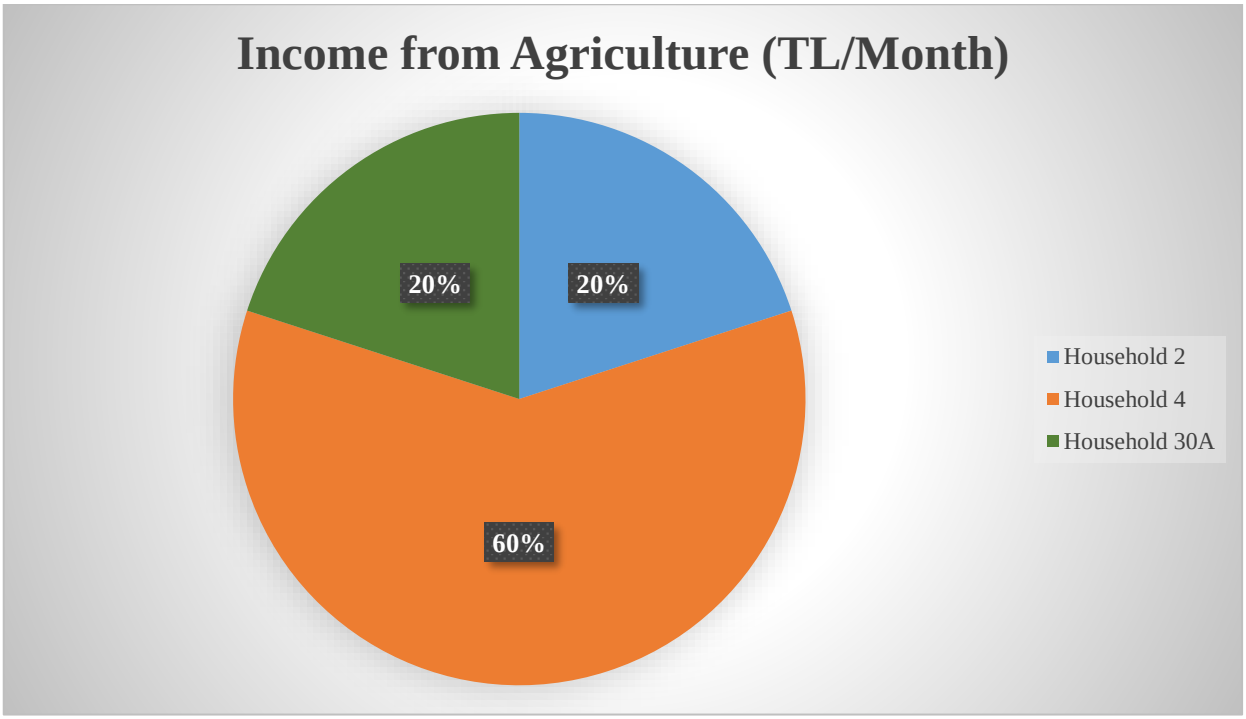


Figure 10. Revenue from agricultural products in different households in Sarıkum Village (%)

As seen in **Figure 11**, when we look at the beekeeping and fishing activities in the village, it was seen that only 1 household was engaged in beekeeping and earned an income of 2000 TL per month, while it was determined that there were 2 households engaged in fishing activities and earned an income of 500 TL and 3000 TL respectively.

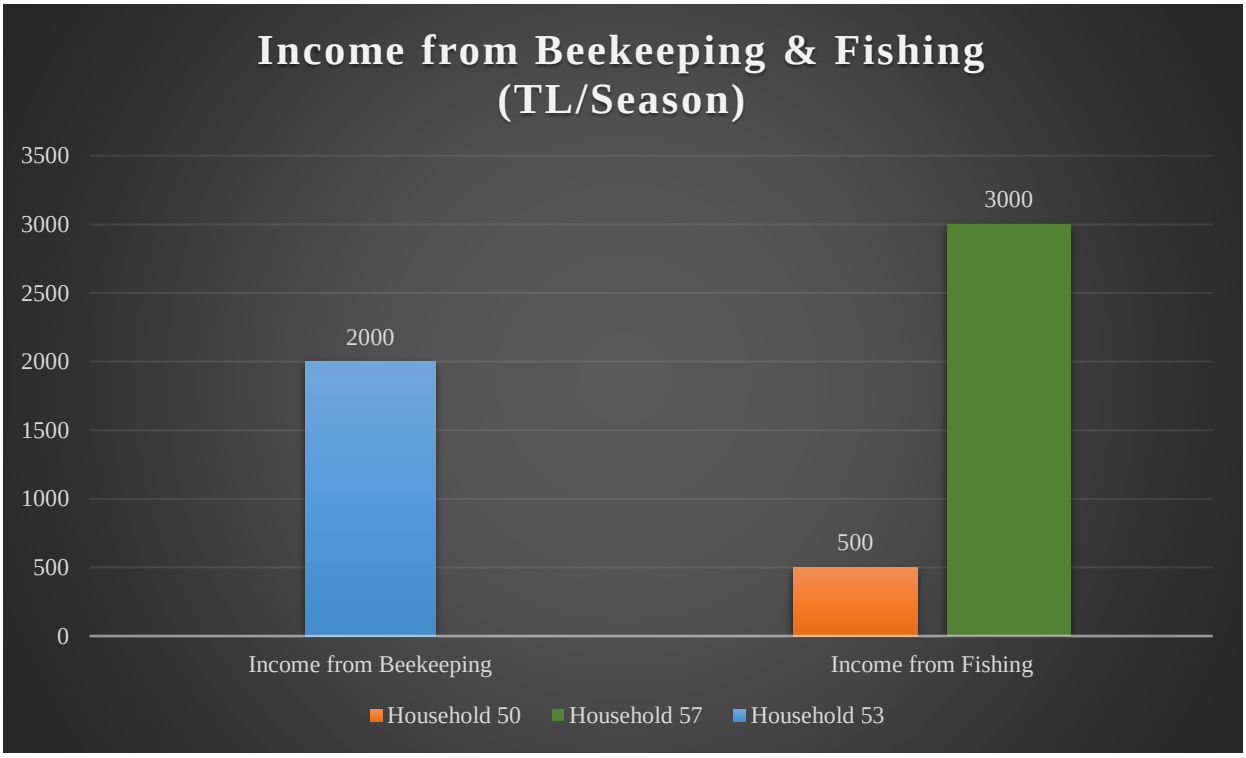


Figure 11. Revenue from other sourcesin different households in Sarıkum Village

Figure 12 shows the income from mushroom collecting activities per households in the village. It has been noted that mushroom picking is an activity that is engaged in by more households than any other activity, as it both strengthens the interaction between women and is relatively easier in terms of workload. In this context, 15 households participate in mushroom picking activities, while one of the households earns a monthly income of 40000 TL, far beyond other households. Another household was observed to have a higher income than other households, with 25000 TL. It has been determined that other households earn incomes ranging from 500TL to 7000TL.

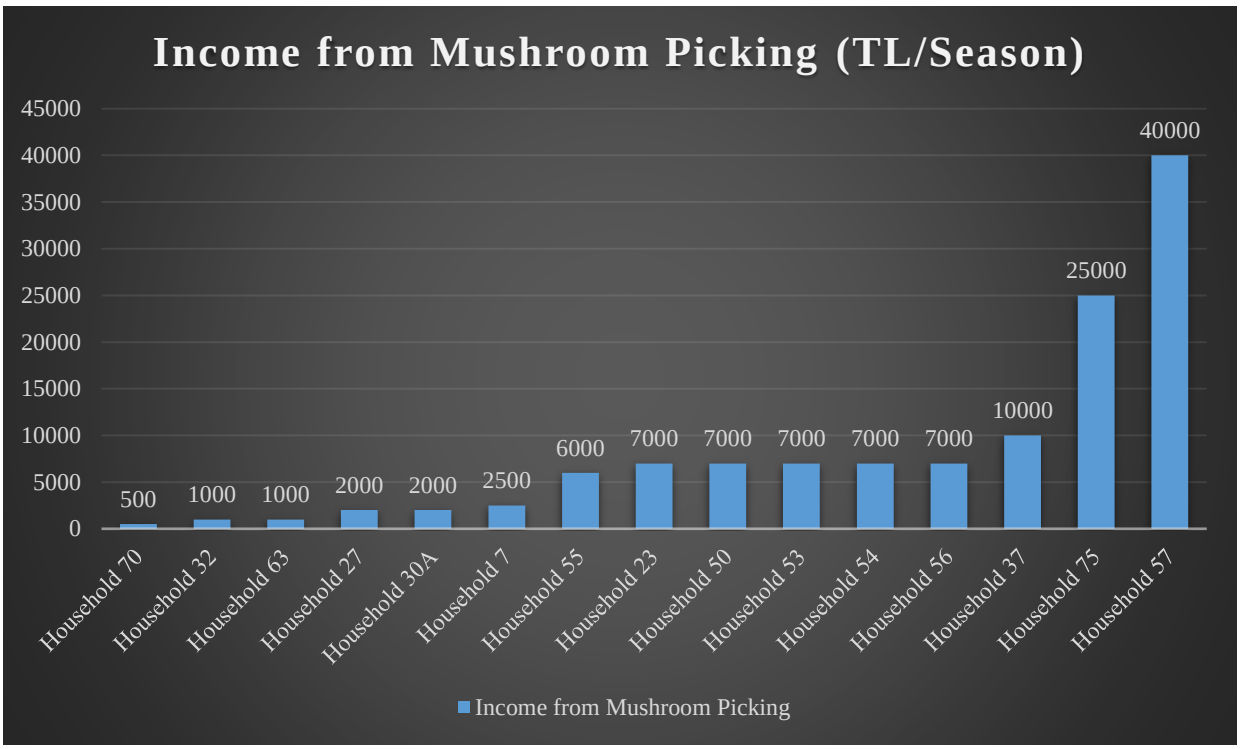


Figure 12. Revenue from mushroom picking in different households in Sarıkum Village

When we look at the number of agricultural tools in the village in **Figure 13**, it is seen that there are tractors in almost every house. It seems that the tractor was purchased as a status tool, even if it was not used for agriculture. There are 32 tractors, 24 trailers and various numbers of agricultural equipment. The distribution of these tools can be seen in **Figure 13**.

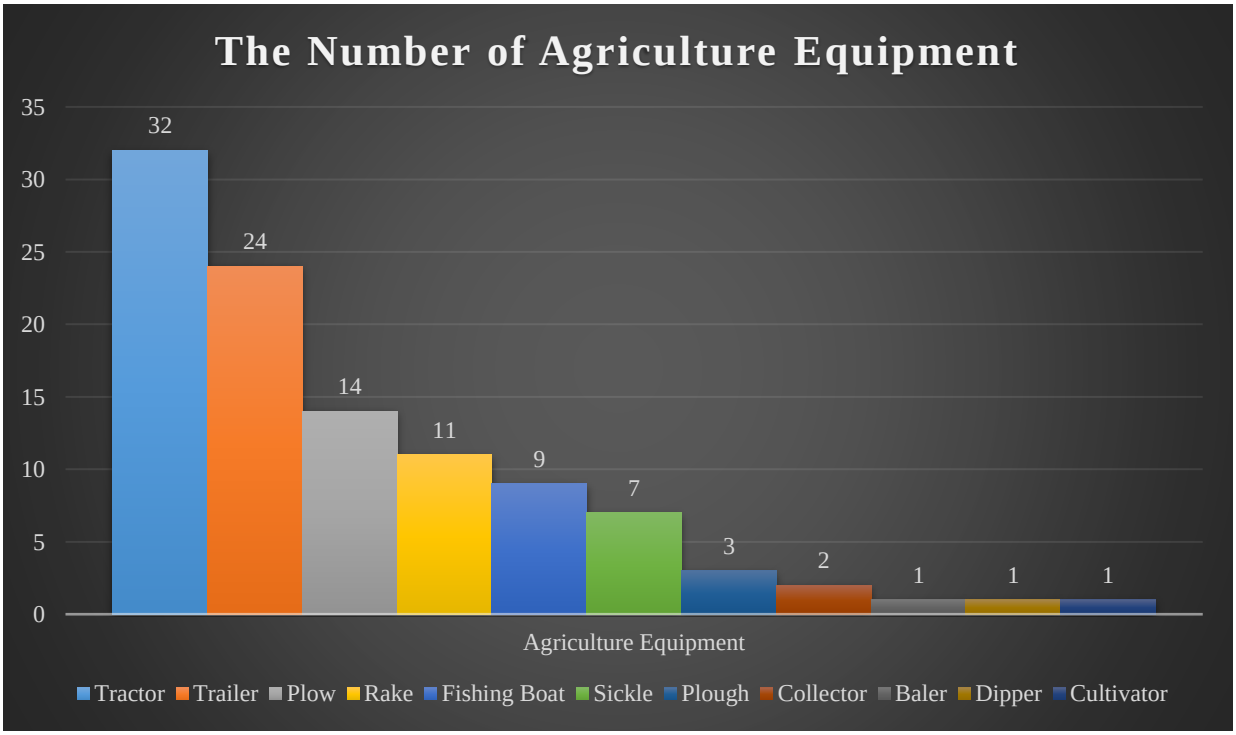


Figure 13. Agricultural machinery in Sarıkum Village

Figure 14 shows the distribution of buildings in the village. While there are 33 chicken coops in total in the village, this number constitutes 39% of the total structure. This situation coincides with the large amount of poultry. As another structure, there are 26 garages, and they constitute 30% of the total number of buildings. This situation coincides with the large number of tractors in the village. The number of structures that can accommodate large and small cattle was determined as 25 and it was observed that it constituted 29% of the total structure. According to the income obtained from livestock statistics, 7 families earned income from livestock farming, and it was determined that 18 barns remained idle.

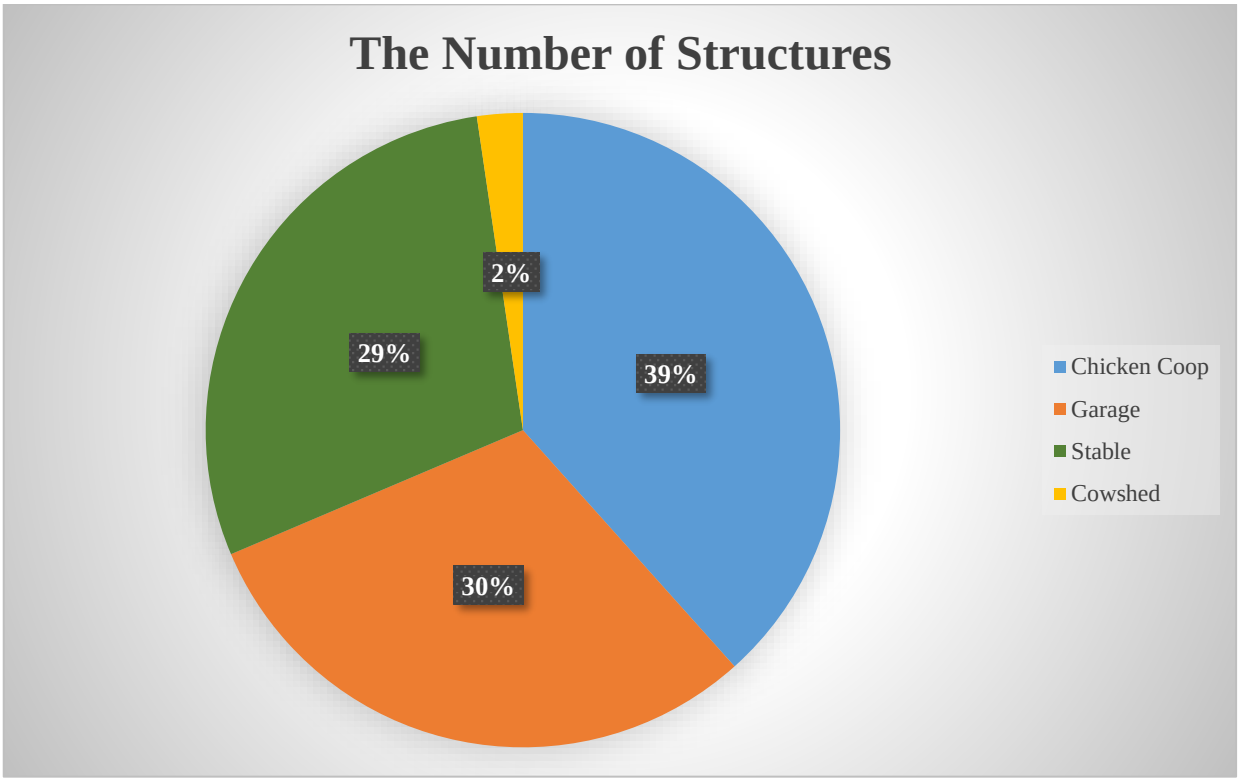


Figure 14. Animal husbandary structures in Sarıkum Village (%)

Figure 15 shows the buildings according to the housing types in the village. While there are 36 reinforced concrete buildings in the village, this number constitutes 82% of the total number of buildings. While there were 5 old and wooden buildings, 3 perfabricated buildings were identified. It is thought that 5 wooden buildings represent the original historical texture of the village and therefore should be protected.

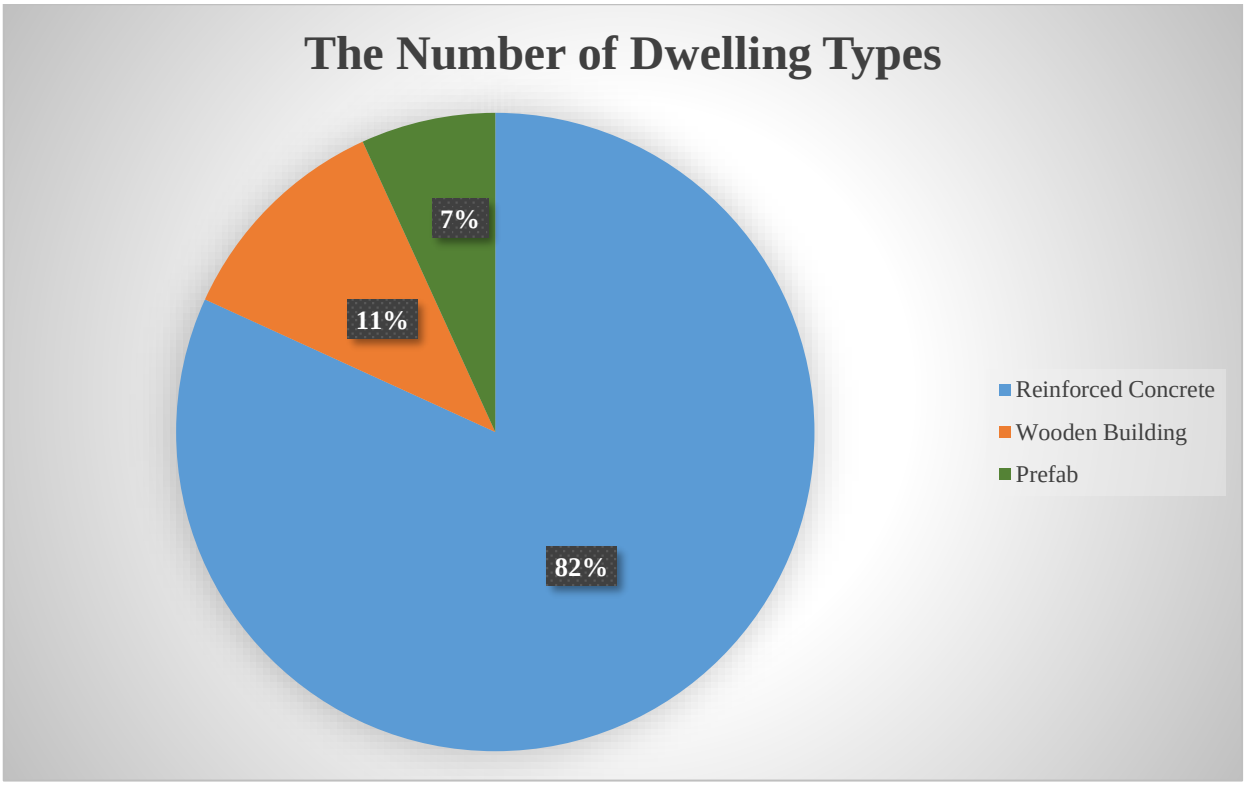


Figure 15. Building structure types in Sarıkum Village (%)

Figure 16 shows the distribution of the amount of land owned by households in the village by square metre. In this context, it was determined that 25 households had land size between 1000-21000 m^2, 9 households had land between 22000-43000 m^2, 3 households had land between 44000-65000 m^2, 2 households had land between 66000-88000 m^2 and 1 household had land between 89000-200000 m^2.

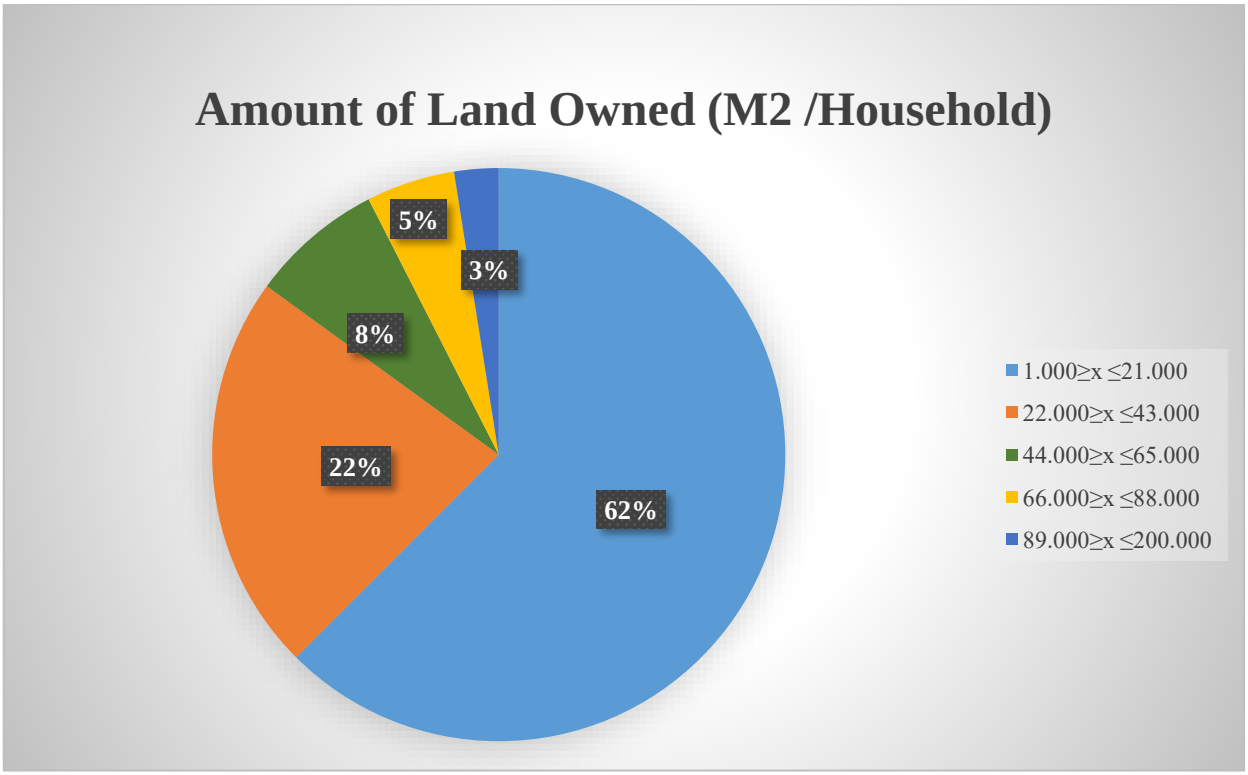


Figure 16. Land ownership in Sarıkum Village (Percentage)

5. Sustainable Rural Develeopment Plan Recommendations

The sustainable rural development recommendations can be grouped into the following 4 categories:

1. Sustainable Jobs and Livelihoods
2. Sustainable Use of Biodiversity
3. Pathway to net zero carbon emissions and adaptation to climate change for a livable future of Sarikum
4. Increased Access to Market and private sector development

5.1. Sustainable jobs and livelihoods

5.1.1. Challenges

The area is already used for ecotourism; however, most visitors are daily visitors as there is no accommodation facilities in Sarikum. Since the area is a protected area, it is not recommended to invest in accommodation infrastructure.

Sustainable Agriculture

For a more sustainable agriculture, it is recommended that neonicotinoid pesticides which kill bees among other insects, should be banned in the region.

There is a demand for husbandry of the water buffalos in most of the houses. However, historically such activities are done out of the Sarikum area, and there is a highway passing between this area and Sarikum. There had been many accidents and according to Turkish laws the owners of the buffalos are responsible when a car hits the buffalo on the highway. It is possible to promote husbandry of the water buffalos on the other side of the road, however this requires an infrastructure of a corridor such as a tunnel for the water buffalos.

Sustainable water and waste management

The village does not have a sewage system, and there is no wastewater treatment which causes a risk for the health of the lake ecosystem.

5.1.2. Opportunities

There is a forest fruit which local people calls bileydin (mountain strawberry, *Arbutus unedo*). This plant has aphrodisiac properties, Vitamin C and decreases blood tension. Local people make marmalade from this plant. A state funded project is recommended for collection and production of bileydin fruit and creating a local brand. There can be a festival organization on bileydin fruit, and magnets and similar handcrafts can be produced.

Similarly, collection of daphne (bay leaf), and producing value added products from this such as soap and extraction of its soil is recommended, as well as creating a local brand.

Since most of the population is old, senior care actıvities and programs should be introduced. If the old population takes part in production mechanisms, they will feel as a beneficial member of the society.

Creation of the marketplace will introduce access to the market. For e-trade making agreements with cargo companies is recommended.

Photography sector can be used as a job creation activity.

Utilization of bileydin fruit and daphne in textile, fashion and handcrafts is recommended.

Linen textile can be promoted.

The region has a potential on apiculture, especially on production of chestnut honey which is the most profitable honey in Türkiye. The chestnut price per kilogram is between 1500 and 2000 Turkish Liras, whereas standard honey price per kilogram is between 300 – 500 Turkish Liras.

There was a demand for fishery in 2 houses only.

It is observed that there exists a problem of efficiency in poultry raising. Previously local people used to provide natural chickhen feed, however today people use commercially available chickhen feed which has decreased production efficiency. People like to consume natural organic eggs; however, these are expensive. Also there can be a demand of tourists on natural organic eggs, if promoted.

5.2. Sustainable Use of Biodiversity

5.2.1. Challenges

Local people state that illegal hunting exists in the area. To combat illegal hunting (Shells were observed in the field, **Figure 17**.), camera traps should be installed in the forest by the Government (Ministry of Agriculture and Forestry). Also, the number of patrolling rangers should be increased. There are illegal hunters among the Sarikum villagers. Some people from other villages also commit illegal hunting activities.



Figure 17. Shells observed in the protected area

It is noted that some villagers do not want camera trap installment, and it is possible that such villagers may be illegal hunters.

5.2.2. Opportunities

Negative incentive measures such as fines should be developed in the management plan. A ranger can be employed by by the Ministry of Agriculture and Forestry or a watchman can be employed by the Ministry of Interior Affairs.

5.3. Pathway to net zero carbon pathway

5.3.1. Data

The data concerning the carbon footprint and related questionnaire results were presented in **Figures 18- 23**.

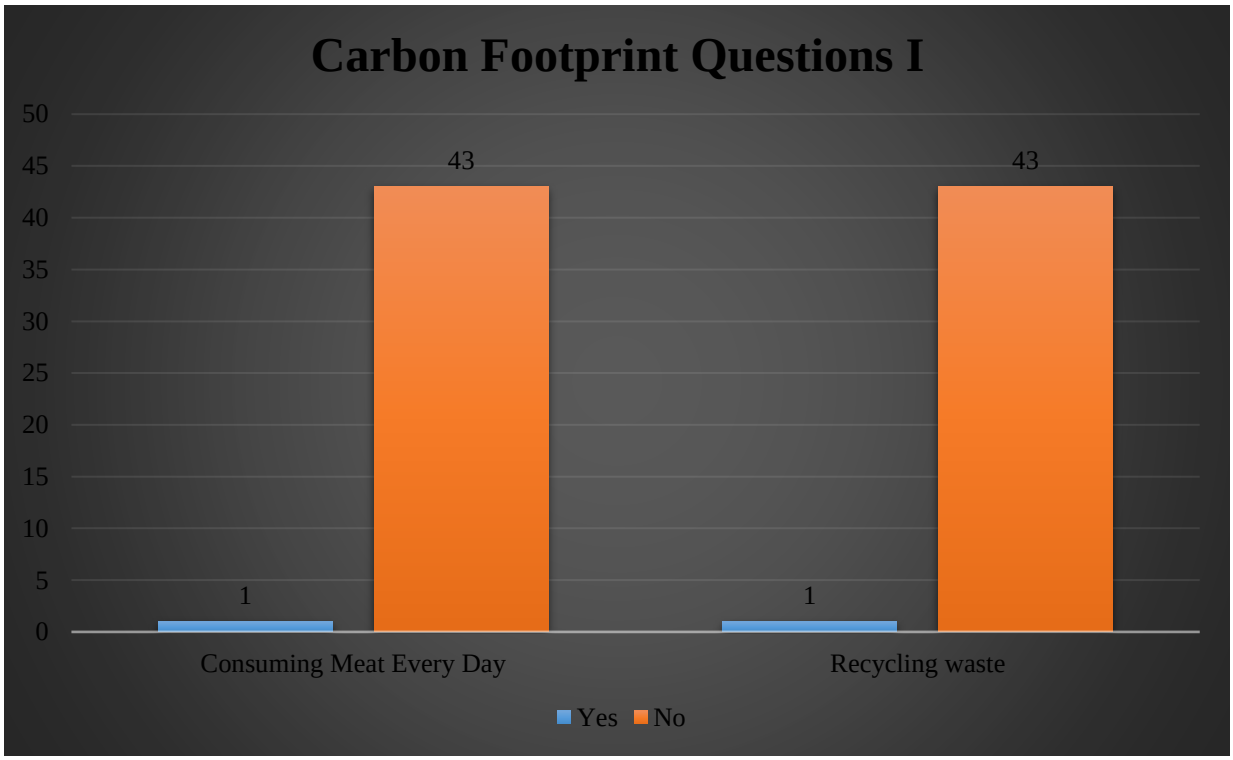


Figure 18. Questionnaire about carbon footprint

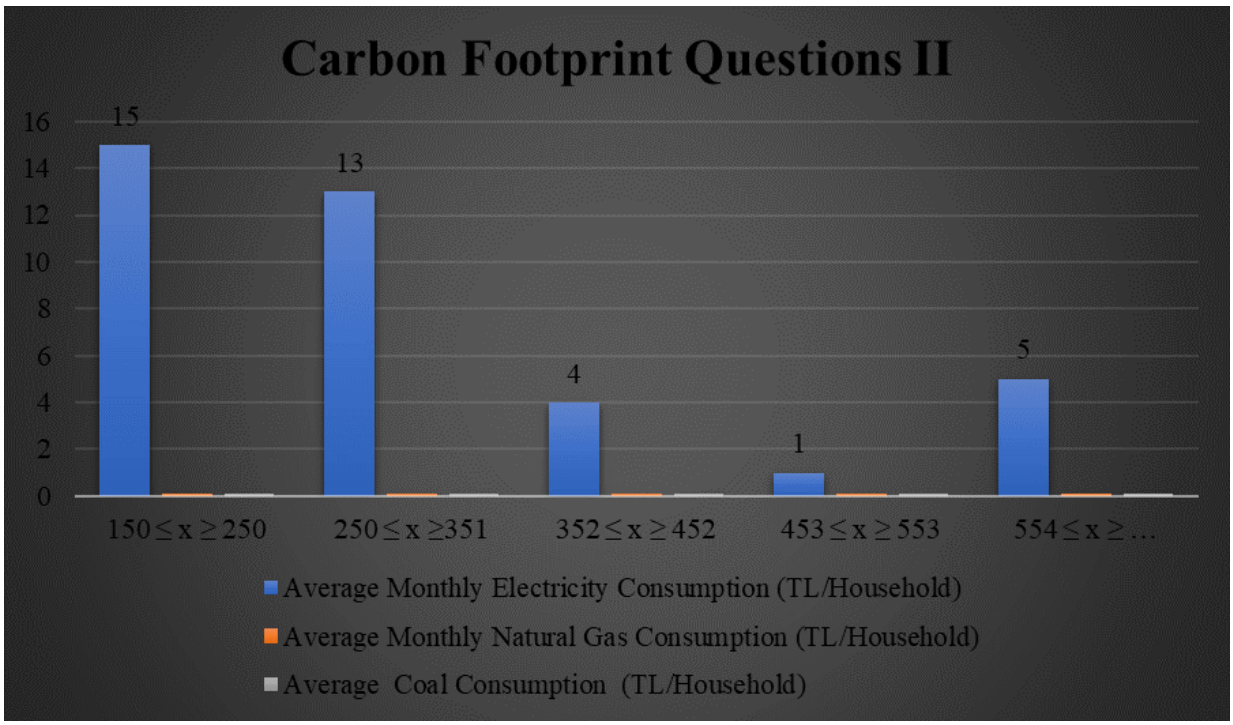


Figure 19. Questionnaire about carbon footprint II

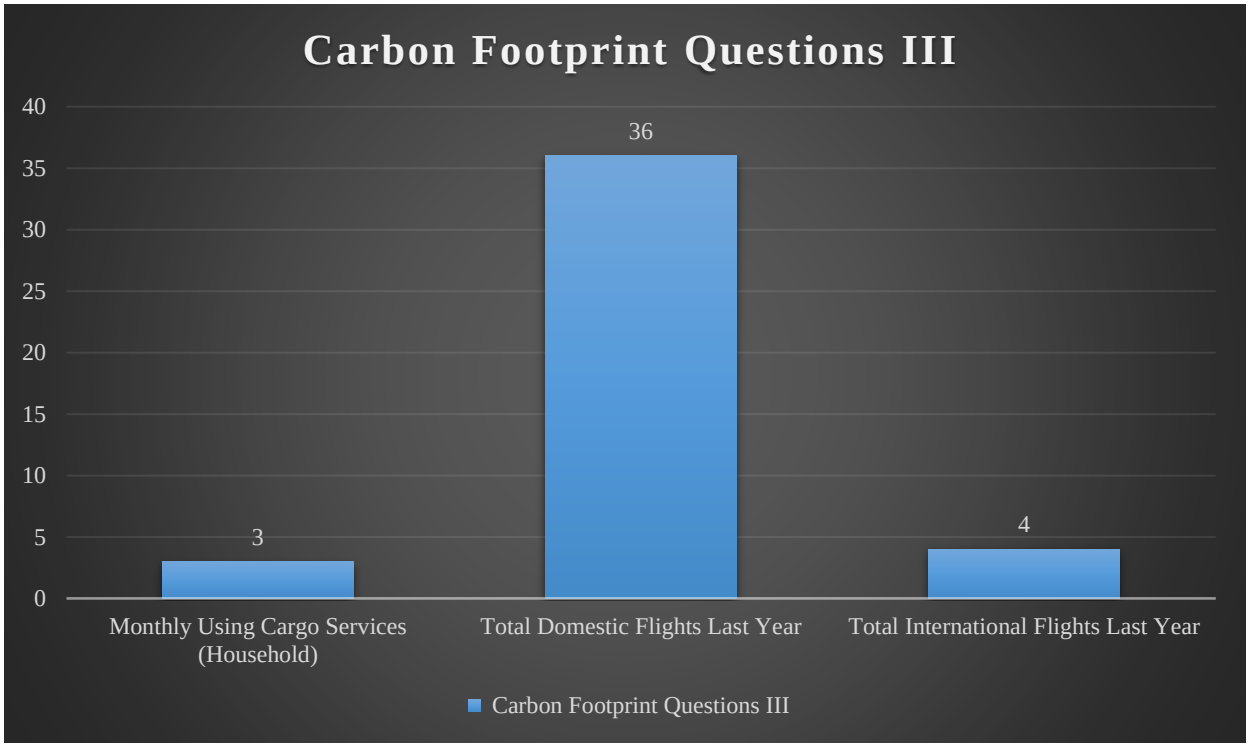


Figure 20. Questionnaire about carbon footprint III

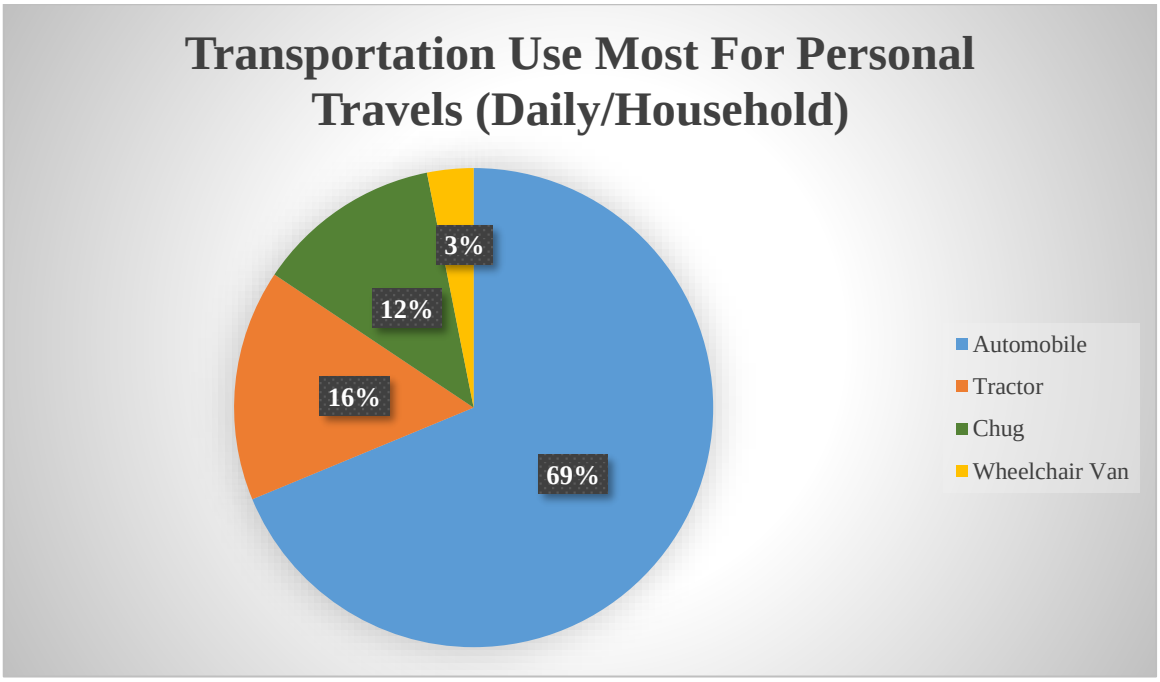


Figure 21. Transportation used in Sarıkum Village (%)

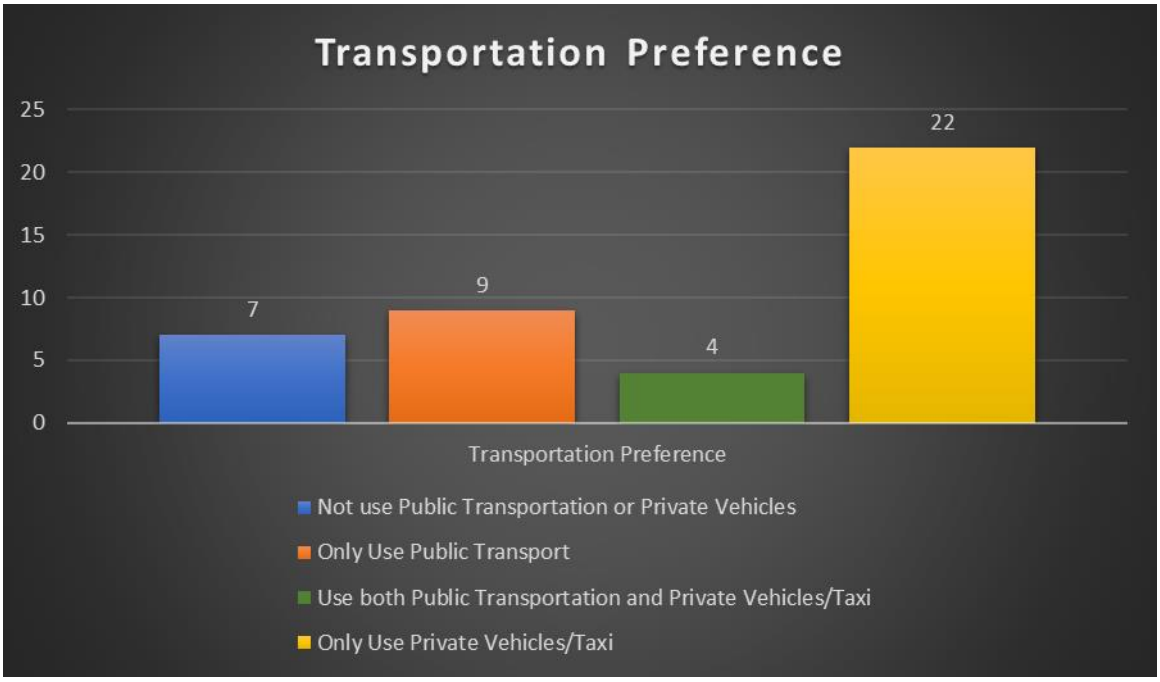


Figure 22. Transportation preferences in Sarıkum Village

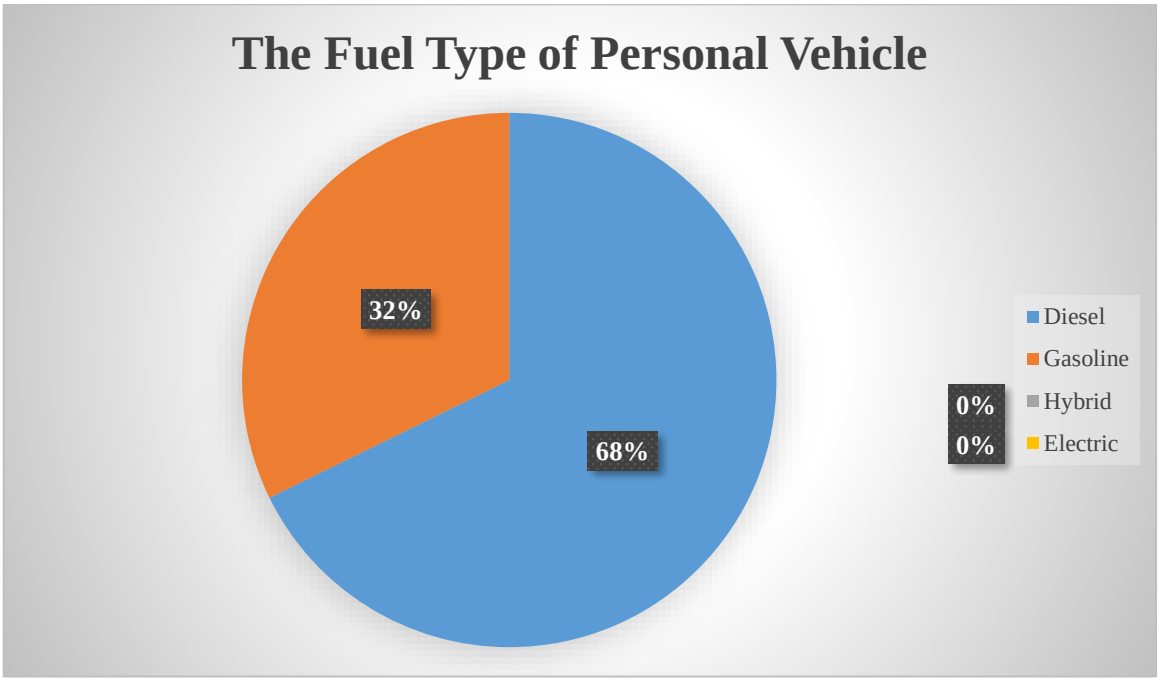


Figure 23. Type of fuel used in personal vehicle in Sarıkum Village (Amount, Percentage)

5.3.2. Challenges

The activity that has the highest carbon footprint is consumption of electricity. For means of heating wood produces the highest carbon footprint, whereas diesel consumption produces the highest carbon footprint with regards to fuel type used in transportation. Rural people create less carbon emission than urban people; they do not use transportation a lot, and do not use airplanes. Most people use their own vehicle while travelling to Sinop city center.

People use fuelwood for heating which causes emission.

Carbon footprint detection studies showed that almost all households in the village do not consume meat every day, while garbage and waste are thrown away without using recycling methods. When we look at energy consumption, it is seen that there is no natural gas and coal consumption in the village, but rather electricity is consumed. It has been determined that most people burn wood for heating. It has been observed that cargo usage is at very low levels of 3 per month, while aircraft usage is 36 per year domestically and 4 per year abroad. When we look at the village population, it is observed that these numbers are quite positive in terms of carbon emissions.

When we look at the modes of transportation in the village and the type of fuel consumed, it is seen that personal vehicle use is dominant with 69%, but it has been determined that they act together as much as possible in their daily use, use shared vehicles when going to the city and provide transportation by informing each other. Due to the large number of tractors, it was observed that diesel fuel preference was higher (68%) than gasoline (32%). No hybrid or electric vehicles were found in the village.

5.3.3. Opportunities

Solar energy is recommended for water heating. The village encounters electric power cuts, so solar electricity would be beneficial, whereas wind energy is not recommended, because the village is on the route of a bird migration route.

There is a need to boost 'green and grey' infrastructure for sustainable/ecotourism.
The path to the village and the path to the protected area is the same path. It is recommended to differentiate between entrances to the village and to the protected area to decrease the tourist car emissions in the protected area. Protected area should have a ticketing system to control and monitor the number of visitors.

5.4. Increased Access to Market

5.4.1. Challenges

The village needs more access to market to increase its income.

5.4.2. Opportunities

There will be a wooden marketplace construction near the highway. This will create an opportunity for increased market access, and it would enhance household income from ecotourism. Making festivals on bileydin fruit and daphne would also increase the income generated in this marketplace. In order to increase awareness, it is recommended that such festivals also involve site visits in the protected area and a visit to the climate museum to be developed.

Some small transportation vehicles working with electricity and golf cars can be used for transportation of the tourists. If people generate income from the protected area and the surrounding forest, they will more protect the environment.

E-trade is recommended for more market access. The sociological survey showed that some women and elder people have expressed an interest on e-trade.

Having a cooperative would also increase market access, especially for disabled groups and old women with regards to active aging.

6. Climate Change Museum

The museum is located in the existing building of the regional directorate in the protected area. The following items were exhibited (**Figure 24-29**):

- A miniature model of the protected area with real topographic scale in the entrance at the left (So that the visitors first understand the general physical geography of the area)
- Maps and scientific graphs with explanation are exhibited on the wall, including climatic data, soil data and biodiversity data
- A taxidermy (embalming) of a bear and those of some other mammals are provided by the regional directorate
- Carot examples



Figure 24. Climate Change Museum_1

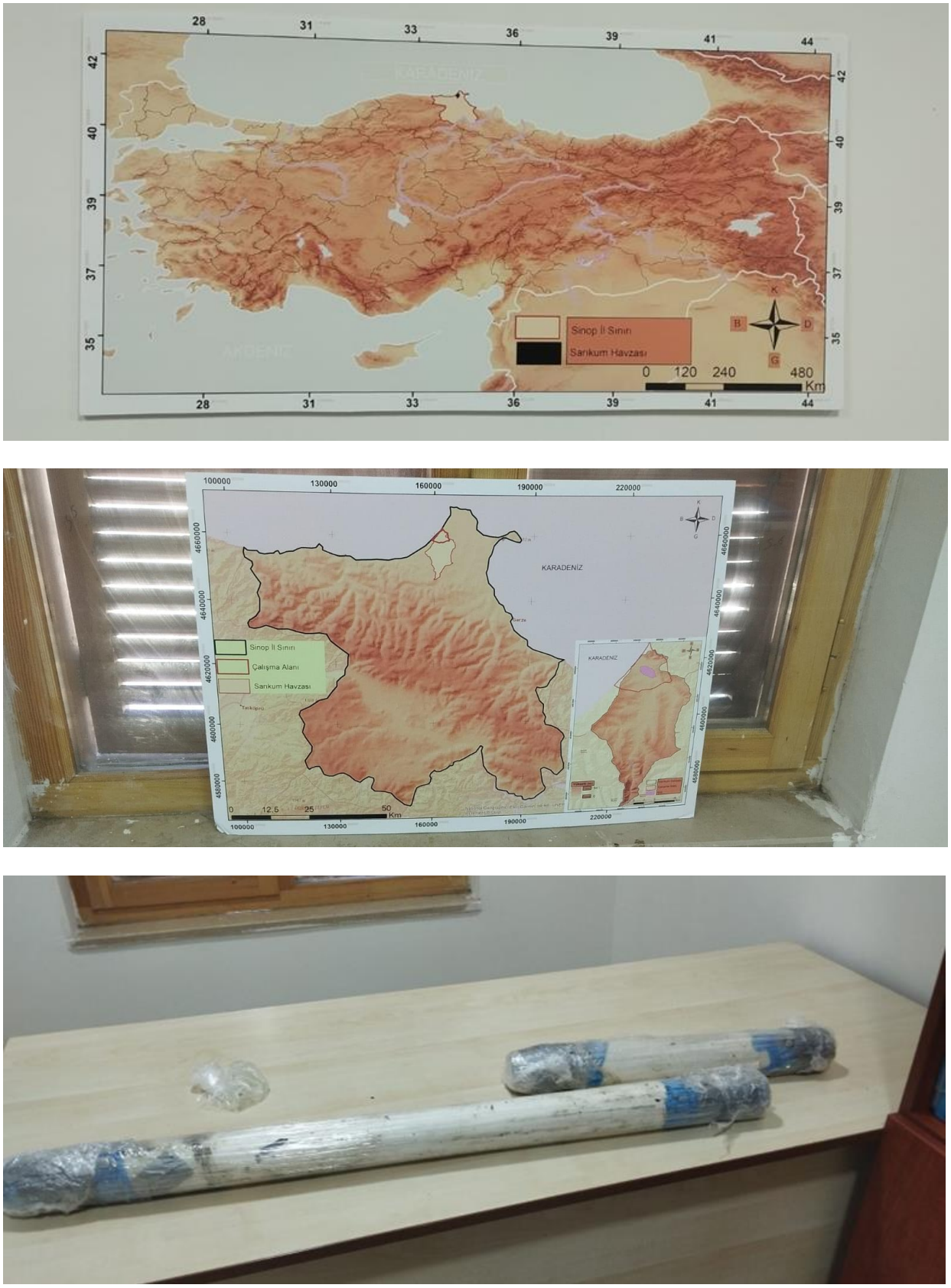


Figure 25. Climate Change Museum_2

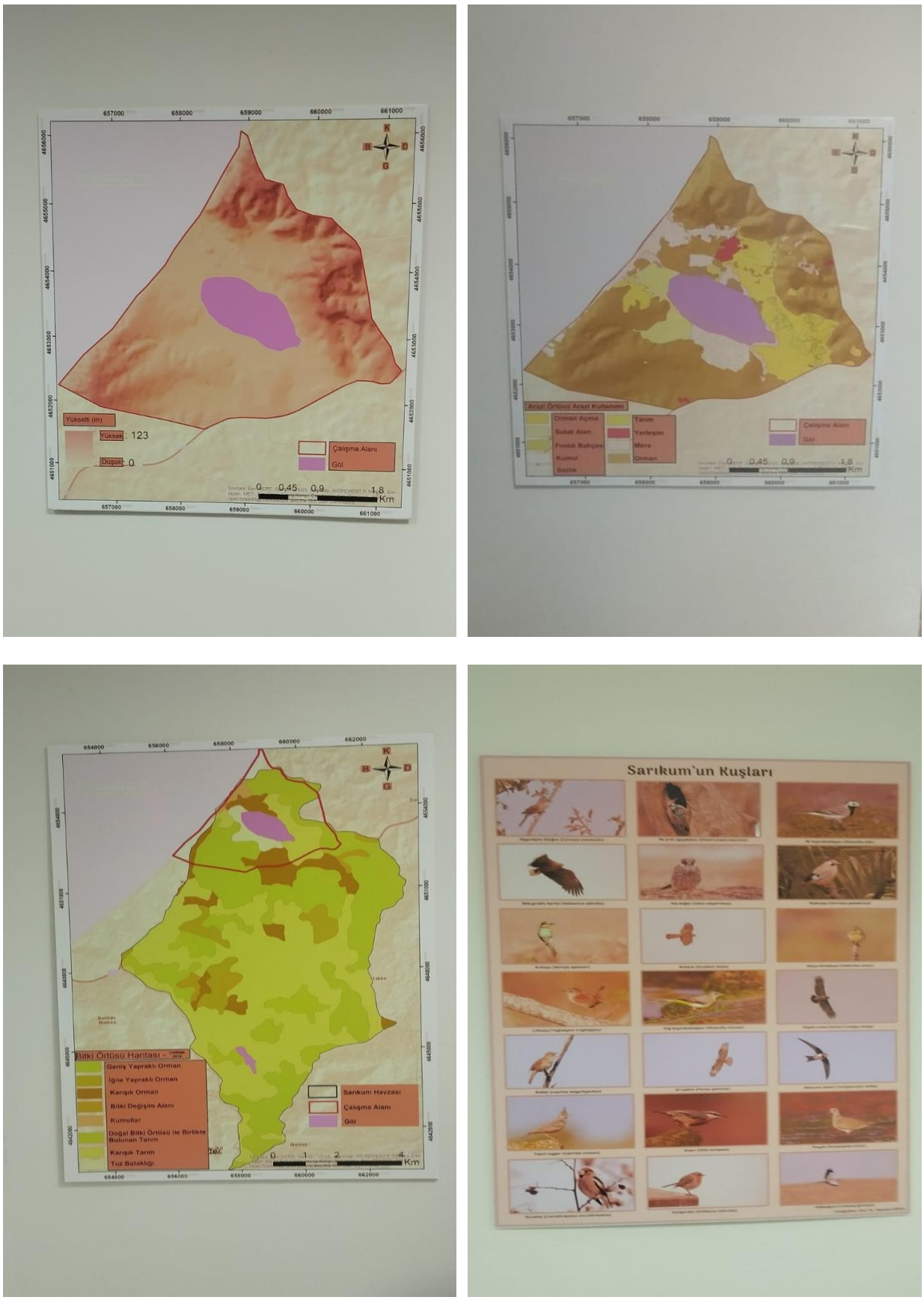


Figure 26. Climate Change Museum_3



Figure 27. Climate Change Museum_4



Figure 28. Climate Change Museum_5



Figure 29. Climate Change Museum_6

7. Training to Students

On 16th February 2024, a training was organized for the 5th grade students of Sinop Merkez Istiklal Secondary School. Bird watching activity, and a visit to the museum was done and Biologist Ahmet Can Tinaz and Local Chief of NCNP Ms Hicran Bayraktar have trained the students on climate change and wildlife issues (**Figure 30**).



Figure 30. Training to Students_1

Total 26 students from Sinop Merkez İstiklalSecondary School and local staff of the Provincial Directorate of DGNCNP have attended the training. 1 hour bird watching activity was carried out in the morning time and many bird species were observed (**Figure 31**).



Figure 31. Training to Students_2

Followingly the museum was visited and the habitat types and properties were told to the students near the topographic model (**Figure 32**).



Figure 32. Training to Students_3

The distribution of keystone species was also presented using the posters and embalmings.

In the conference room of the museum building, a one hour presentation was done on project results, climate change and wildlife by Mr. Ahmet Can TINAZ and Ms. Hicran Bayraktar Nalbantoğlu (**Figure 33**).



Figure 33. Training to Students_4

It was observed that although the students were 10-12 years old at an average, their motivation and interest were high and the students asked very detailed questions on climate change and biodiversity. Snacks and fruit juice were provided to the students by the regional directorate free of charge (**Figure 34-35**).



Figure 34. Training to Students_4



Figure 35. Training to Students_5

8. The Way Forward

This project is the first project of Turkiye aiming rural development of local people living in protected areas. The methodology of this project is first making a sound ecological and environmental analysis exposing ecosystem services with possible value of income generation. Then an ethnographic analysis is carried out by a sociologist and an economist, and the priorities and demands of people are explored, as well as the situation of women, vulnerable and disabled groups. Then by the pioneering role of the microeconomist, all project team had developed a rural development plan addressing climate resilience and sustainable use of biodiversity. A project with this methodology can be used in all protected areas of Turkiye.

Climate Investmend Fund, GEF and EU grants, and credit from the World Bank can be used with this purpose. It is recommended to work with the World Bank, because the know how of this first project is accumulated in the World Bank as the project implementer.

There is a programme in Sinop University with the name "3rd Age University" which provides training to elder population. This may be beneficial to the elder population of the Sarikum Village. "The Natural Products Research and Application Center" of the Sinop University can be part of the festival preparations.

The sociology department of the Sinop University had carried out a project with the name "Old Friend" before. This project may also be carried out in Sarikum Village.

The DGNCNP can prepare a public service advertisement about this project. The findings of the project are intended by the client to be used in developing management plan for the Sarikum Protected Area.

ANNEX 1. PLANT SPECIES IN SARIKUM NCA

(All data presented here are 2007 Spring and Autumn Data taken from the Regional Directorate)

Section: **PTERIDOPHYTA**

Class: **SPHENOPSİDA**

EQUISETACEAE

1. *Equisetum ramossisimum*Desf.

ADIANTACEAE

2. *Adiantum capillus-veneris* L.

HYPOLEPIDACEAE

3. *Pteridium aquilinum* (L.) Kuhn.

ASPLENIACEAE

4. *Asplenium trichomanes*L.
5. *Asplenium adianthum - nigrum* L.
6. *Asplenium onopteris*L.

POLYPODIACEAE

7. *Polypodium australe*Fée

Section: **SPERMATOPHYTA**

Class: **GYMNOSPERMAE**

PINACEAE

8. *Pinus brutia* Ten. Kızılçam
9. *Pinus nigra* Arn subsp. *pallasiana* (Lamb.) Holmboe
10. *Pinus maritima* Ait.
11. *Juniperus oxycedrus* L. subsp. *oxycedrus*

Class: **ANGIOSPERMAE**

SubClass: **DICOTYLEDONEAE**

RANUNCULACEAE

12. *Helleborus orientalis* Lam.
13. *Ranunculus repens* L.

14. *Ranunculus constantinopolitanus* (DC)d'Urv.
15. *Ranunculus gracilis* Clarke
16. *Ranunculus marginatus*d'Urv. subsp. *trachycarpus* (Fish& Mey) Azn.
17. *Ranunculus muricatus* L.
18. *Ranunculus ficaria* L. subsp. *calthifolius* (Reichb) Arc.
19. *Ranunculus trichophyllus.* L.
20. *Ranunculus saniculifolius* Viv.

RANUNCULACEAE

21. *Clematis vitalba* L.

BERBERIDACEAE

22. *Epimedium pubigerum (*DC*)* Moren&Decaisne

PAPAVERACEAE

23. *Papaver rhoeas* L.
24. *Papaver commutatum* Fisch&Mey.
25. *Papaver hybridum* L.
26. *Fumaria officinalis*
27. *Chelidonium majus* L.

CRUCIFERAE (Brassicaceae)

28. *Sinapis arvensis* L.
29. *Raphanus raphanistrum* L.
30. *Calepinairregularis* (Asso.) Thellung
31. *Cakile maritima* Scop
32. **Isatis arenaria* L.
33. *Capsella bursa-pastoris* (L.) Medik.
34. *Alyssum stribrynyi* Vel.
35. *Arabis hirsute* Scop.
36. *Arabis sagittata* (Bertol) DC.
37. *Nasturtium officinalis* R. Br.
38. *Cardaria draba*
39. *Cardamine tenera* Gmel.
40. *Cardamine hirsute* L.
41. *Marasia nana* (DC.) Batt.
42. *Thlaspi arvense*

43. *Alliaria petiolata* (Bieb.) Cavara & Grande

44. *Sisymbrium altissimum* L.

45. *Erophila verna* L.

RESEDACEAE

46. *Reseda lutea* L. var. *lutea*

CISTACEAE

47. *Cistus creticus* L.

48. *Cistus parviflorus* Lam.

49. *Helianthemum salicifolium* (L.) Miller

VIOLACEAE

50. *Viola sieheana* Becker.

51. *Viola arvensis* Murroy.

52. *Viola odorata*

53. *Viola tricolor*

POLYGALACEAE

54. *Polygala monspeliaca* L.

PORTULACACEAE

55. *Portulaca oleracea* L.

CARYOPHYLLACEAE

56. *Areneria serpyllifolia* L.

57. *Moehringia trinervia* (L.) Clairv.

58. *Stellaria media* (L.) Vill. subsp. *media*

59. *Stellaria holostea* L.

60. *Cerastium anomalum* Waldst& Kit.

61. *Cerastium glomeratum* Thuill.

62. *Cerastium gracile* Duf.

63. *Holesteum umbellatum* L. var.*glutinosum* (Bieb.) Gay.

64. *Moenchia mantica* (L.) Bartl. subsp.*mantica*

65. *Spergularia media* (L.) C. Presl

66. *Spergularia marina* (L.) Gris.

67. *Dianthus capitatus*

68. **Dianthus carmelitarum* Reut ex Boiss.

69. *Petrorhagia prolifera* (L.) Ball & Heywood.

70. *Silene vulgaris* (Moench) Garcke var. *vulgaris.*

71. *Silene alba* (Miller) Krause. subsp.*eriocalycina* (Boiss) Walters
72. *Silene dichotoma* Ehrh. subsp.*dichotoma*
73. *Silene dichotoma* Ehrh. subsp.*euxina* (Rupr.) Coode & Cullen
74. *Silene bellidifolia* Jacq.

POLYGONACEAE

75. *Polygonum hydropiper* L.
76. *Polygonum maritimum* Chrtek.
77. *Polygonum mesembricum* Chrtek.
78. *Polygonum convolvulus* L.
79. *Rumex crispus*
80. *Rumex pulcher*
81. *Rumex tuberosus* L. subsp. *tuberosus*
82. *Rumex hydrolapathum*

CHENOPODIACEAE

83. *Beta maritima* L. var. *maritima*
84. *Chenopodium murale* L.
85. *Chenopodium album* L. subsp. *album* var. *album*
86. *Corispermum filifolium* C.A. Meyer
87. *Salsola ruthenica* Iljin

AMARANTACEAE

88. *Amaranthus retroflexus* L.
89. *Amaranthus patulus* Bert.
90. *Amaranthus albus* L.

PHYTOLACCACEAE

91. *Phytolacca americana* L.

TAMARICACEAE

92. *Tamarix parviflora* DC.

GUTTIFERAE (Hypericaceae)

93. *Hypericum tetraptorum* Fries
94. *Hypericum perforatum* L
95. *Hypericum calycinum*

MALVACEAE -

96. *Malva sylvestris* L.
97. *Malva nicaensis* All.

98. *Lavatera bryoniifolia* Miller

99. *Althae officinalis* L.

100. *Alcea pallida* Waldst & Kit.

LINACEAE

101. *Linum corymbulosum* Reichb.

102. *Linum trigynum* L.

103. *Linum bienne* Miller

GERANIACEAE

104. *Geranium purpureum* Vill.

105. *Geranium molle* L. subsp. *molle*

106. *Geranium pusillum* Burm.

107. *Geranium dissectum* L.

108. *Geranium maculoides* (L.) L'Herit.

109. *Geranium robertianum*

110. *Geranium rotundifolium*

111. *Geranium asphodeloides* subsp. *asphodeloides*

112. *Erodium cicutarium* (L.) L'Herit. subsp. *cicutarium*

113. *Erodium acule* (L.) Becherer & Thell.

OXALIDACEAE

114. *Oxalis cornuculata* L.

RUTACEAE

115. *Ruta chalepensis* L.

116. *Dictamnus albus* L.

ACERACEAE

117. *Acer trauvetteri* Medw.

118. *Acer platanoides* L

119. *Acer campestre* L. subsp. *campestre*

VITACEAE

120. *Vitis sylvestris* Gmelin

RHAMNACEAE

121. *Paliurus spina-christi* Miller

AQUIFOLIACEAE

122. *Ilex colchica* Poj.

ANACARDIACEAE

123. *Rhus coriaria* L.
124. *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler

CELASTRACEAE

125. *Euonymus europaeus* L.

LEGUMINOSAE (Fabaceae)

126. *Chamaecytisus austriacus* (L.) Link.
127. *Genista tinctoria* L.
128. *Lupinus micranthus* Guss.
129. *Spartium junceum* L.
130. *Robinia pseudoacacia* L.
131. *Astragalus hamosus* L.
132. *Psoralea bituminosa* L.
133. *Vicia villosa* Roth, subsp.*villosa*
134. *Vicia hybrid* L.
135. *Lathyrus incurvus* (Roth.) Willd.
136. *Lathyrus laxiflorus* (Desf.) O.Kuntze
137. *Lathyrus aphaca* L. var. *aphaca*
138. *Ononis spinosa* L. subsp.*leiosperma* (Boiss.) Sirj.
139. *Trifolium campestre* L.
140. *Trifolium tumens* Stev. Ex Bieb.
141. *Trifolium stellatum* L. var.*stellatum*
142. *Trifolium scabrum* L.
143. *Trifolium affine* C.Presl
144. *Trifolium subterraneum* L.
145. *Melilotus neopalitana* Ten.
146. *Medicago orbicularis* (L.) Bart.
147. *Medicago lupulina* L.
148. *Medicago marina* L.
149. *Medicago xvaria Martyn*
150. *Medicago falcata* L.
151. *Medicago polymorpha* L. var. *polymorpha*
152. *Medicago rigudula* (L.) All. var. *agrestis* Burniat.
153. *Dorycnium graecum* (L.) Ser.
154. *Lotus corniculatus* L. var.*tennuifolius*

155. *Securigera securida* (L.) Degen & Dörf.

156. *Scorpiurus muricatus*L. var.*subvillosus* (L.) Fiori.

ROSACEAE

157. *Prunus spinosa* L. subsp. *dasyphylla (*Schur.) Domin.

158. *Prunus xdomestica*L.

159. *Filipendula vulgaris* Moench

160. *Rubus sanctus* Schreber.

161. *Rubus canescens* DC. var.*glabratu* (Godron) Davis & Meikle

162. *Potentilla recta* L.

163. *Potentilla umbrosa* Stev. ex Bieb.

164. *Potentilla reptans* L.

165. *Fragaria vesca* L.

166. *Geum urbanum* L.

167. *Agrimonia eupatoria* L.

168. *Sanguisorba minor* Scop.subsp. *muricata* (Spach) Briq.

169. *Rosa canina* L.

170. *Mespilus germanica* L.

171. *Pyracantha coccinea* Roemer.

172. *Crataegus pentagyna* Waldst& Kit. ex Willd.

173. *Crataegus monogyna* Jacq.subsp.*monogyna*

174. *Crataegus monogyna* Jacq.subsp.*azarella* (Gris.) Franco.

175. *Crataegus microphylla* C. Koch

176. *Cydonia oblonga* Miller

177. *Malus sylvestris* Millersubsp.*orientalis* (A.Uglitzkich) Browicz var.*orientalis*

178. *Pyrus amygdaliformis* Vill. var. *lanceolata* Diap.

179. *Pyrus elaeagnifolia* Pallas, subsp.*elaeagnifolia*

MYRTACEAE

180. *Myrtus communis* L.subsp. *communis*

LYTRACEAE

181. *Lythrum salicaria* L.

ONAGRACEAE

182. *Epilobium hirsutum* L.

183. *Epilobium parviflorum* Schreber

CUCURBITCEAE

184. *Epilobium parviflorum* Schreber

CRASSULACEAE

185. *Sedum acre* L.

186. *Sedum album* L.

187. *Sedum pallidum Bieb.* var. *pallidum*

UMBELLIFERAE(Apiaceae)

188. *Sanicula europaeae* L.

189. *Eryngium maritimum* L.

190. *Eryngium campestre* L.

191. *Scandix pecten-veneris* L.

192. *Berulaerecta* (Huds.) Caville

193. *Crithmum maritimum* L.

194. *Oenanthe aquatica* (L.) Poiret

195. *Foeniculum vulgare* Miller

196. *Apium graveolens* L.

197. *Peucedanum obtusifolium* Sm.

198. **Heracleum platytaenium* Boiss.

199. *Torillis arvensis* (Huds.) Link subsp. *neglecta* (Sprengel) Thellung

200. *Torillis leptophylla* (L.) Reichb.

201. *Daucus carato* L.

202. *Daucus broteri* L.

ARALIACEAE

203. *Hedera helix* L.

204. *Hedera colchica* (C. Koch) C. Koch

CORNACEAE

205. *Cornuss anguinea* L. subsp. *australis* (C. A. Meyer) Jàv.

CAPRIFOLIACEAE

206. *Sambucus ebulus* L.

VALERIANACEAE

207. *Valerianella dentata* (L.) Pol

DIPSACACEAE

208. *Scabiosa columbaria* L.subsp. *columbaria* var. *columbaria*

209. *Scabiosa argentea* L.

COMPOSITAE *(Asteraceae)*

210. *Bidens cernua* L.
211. *Xanthium spinosum* L.
212. *Xanthium strumarium* L.subsp.*strumarium*
213. *Inula graveolens* (L.) Desf.
214. *Pulicaria dysenterica* (L.)Bernh.
215. *Pallenis spinosa* L.
216. *Gnaphalium luteo-album* L.
217. *Filoga pyramidata* L.
218. *Aster tripolium* L.
219. *Erigeron acer* L. subsp. *pycnotrichus* (Vierh) Grierson
220. *Bellis perennis* L.
221. *Doronicum orientale* Hoffm.
222. *Senecio aquaticus Hill*.subsp.*erraticus* (Bertol) Matthews
223. *Senecio vernalis* L.
224. *Tussilago farfara* L.
225. *Calendula arvensis* L.
226. *Eupatorium cannabinum* L.
227. *Anthemis tinctoria* L. var. *pallida* DC.
228. *Matricaria chamomilla* L.
229. *Carduus nutans*.
230. *Jurinea kilaea* L.
231. *Otanthus maritimus* Hoffm.
232. *Tanacetum parthenium* (L.) Schultz
233. *Tripleurospermum oreades* (Boiss.) Rech. var. *oreades*
234. *Cynara cardunculus* L.
235. *Onopordum tauricum* Willd.
236. *Silybum marianum* (L.) Gaertner
237. *Circium vulgare* (Savi.) Ten.
238. *Circium pseudopersonata* Boiss.& Bal. subsp. *pseudopersonata*
239. *Carthamus lanatus* L.
240. *Carthamus glaucus Bieb.* subsp. *glaucus*
241. *Carlina lanata* L.
242. *Scolymus hispanicus* L.

243. *Cichorium intybus* L.
244. *Helminthotheca echioides* (L.) Holub
245. *Tragopogon aureus* Boiss.
246. *Hedypnois cretica* (L.) Dum.-Cours.
247. *Rhagadiolusstellatus* (L.) Gaertner var. *edulis* (Gaertner) DC
248. *Sonchus asper* (L.) *Hill.,* subsp.*gaucescens* (Jordan) Ball
249. *Sonchus oleraceus* L.
250. *Mulgedium tataricum* (L.) DC
251. *Hieracium umbellatum* L
252. *Pilosellax auriculoides* (A. F. Láng) Sell & West.
253. *Steptorhamphus tuberosus* (Jacq.) Grossh
254. *Lactuca saligna* L
255. *Lapsana communis* L.subsp. *intermedia* (Bieb.) Hayek
256. *Taraxacum macrolepium* Ssischkin
257. *Taraxacum revertens* G. Hagl.
258. *Crepis foetida* L. subsp. *foetida*
259. *Crepis foetida* L. subsp. *rhoedifolia*(Bieb.) Célak

CAMPANULACEAE

260. *Campanula sibirica* L. subsp.*hohenackeri* (Fisch. & Mey.) Dumbolt
261. *Campanula glomerata* L.
262. *Legousia speculum –veneris* (L.) Chaix.
263. *Asyneuma limonifolium* (L.)*Janchen,* subsp.*pestalozzae* (Boiss.) Dumbolt,

ERICACEA

264. *Rhododendron luteum* L.
265. *Erica arborea* L.
266. *Calluna vulgaris* (L.)Hull.
267. *Arbutus unedo* L.

PRIMULACEAE

268. *Primula vulgaris* Huds. subsp. *vulgaris*.
269. *Primula vulgaris* Huds. subsp.*sibthorpii* (Hoffmans) W.W.Sm. & Forrest.
270. *Lysimachia verticillaris* Sprengel
271. *Lysimachia vulgaris*
272. *Lysimachia nummularia*

273. *Anagallis arvensis* L. var. *arvensis*

274. *Anagallis arvensis* L. var. *caerulea* (L.) Govan

275. *Cyclamen coum var. coum*

276. *Samolus valerandi* L.

OLEACEAE

277. *Jasminum fruticans* L.

278. *Fraxinus angustifolia* Vahl. subsp.*oxycarpa* (Bieb. Ex Willd.) Franco & Rocha

279. *Ligustrum vulgare* L.

280. *Olea europaea* L. var. *sylvestris* (Miller) Lehr.

281. *Phillyrea latifolia* L.

APOCYNACEAE

282. *Vinca major* L. subsp.*hirsuta (*Boiss.*)* Stearn

ASCLEPIADACEAE

283. *Periplocagraeca*L. var.*graeca*

284. *Cynanchum acutum* L. subsp. *acutum*

285. *Cionura erecta* (L.) Griesb.

GENTIANACEAE

286. *Blackstonia perfoliata* (L.) Hudsonsubsp. *serotina* (W. Koch ex Reichb.)Vollman

287. *Centaurium erythraea* Rafn subsp. *turcicum* (Velen.) Melderis

288. *Centaurium pulchellum* (Swartz)Druce

289. *Centaurium tenuifolium* (Hoffmans & Link) Fritsch.subsp. *tenuifolium.*

290. *Centaurium maritimum* (L.) Fritsch

CONVOLVULACEAE

291. *Convolvulus persicus* L.

292. *Convolvulus cantabrica* L.

293. *Convolvulus arvensis* L.

294. *Clystegia soldanella* (L.) R. Br.

295. *Clystegia sepium* (L.) R. Br. subsp. *sepium*

296. *Clystegia silvatica* (Kit.) Griseb.

CUSCUTACEAE

297. *Cuscuta epithymum* (L.) L.var. *epithymum*

BORAGINACEAE

298. *Heliotropium europaeum* L.
299. *Heliotropium dolosum* De Not.
300. *Myosotis incrassate* Guss.
301. *Myosotis littoralis* Steven ex Bieb.
302. *Myosotis ramosissima* Rockel ex Schultessubsp.*uncata* (Boiss. & Bal.) Grau
303. *Myosotis arvensis* (L.) Hill, subsp. *arvensis*
304. *Myosotis alpestris* (L.) F. W. Schmidt subsp. *alpestris*
305. *Cynoglossum officinale* L.
306. *Cynoglossum creticum* Miller
307. *Lithospermum purpurocaeruleum* L.
308. *Echium italicum* L.
309. *Echium vulgare* L.
310. *Echium plantagineum* L.
311. *Echium angustifolium* Miller
312. *Trachystemon orientalis* (L.) D. Don
313. *Anchusa azurea* Miller var. *azuera*
314. *Nonea optusifolia* (Willd.) DC.

SOLANACEAE

315. *Solanum nigrum* L. subsp. *nigrum*
316. *Physalis alkekengi* L.
317. *Datura stromonium* L.
318. *Hyoscyamus albus* L.
319. *Hyoscyamus niger* L.

SCROPHULARIACEAE

320. *Verbascum blattaria* L.
321. *Verbascum macrocarpum* Boiss.
322. *Verbascum gnaphalodes* Bieb.
323. *Verbascum heterobarbatum*
324. *Verbascum bithynicum*
325. *Verbascum sinuatum* L. var. *sinuatum*
326. *Verbascum degenii* Hal.
327. *Scrophularia scopolii* (Hoppe ex) Pers. var. *scopolii*
328. *Scrophularia canina* L. subsp. *bicolor* (Sm.) Greuter

329. *Linaria pelisseriana* (L.) Miller.
330. *Kickxia spuria* (L.) Dumort. subsp. *integrifolia* (Brot.) R. Fernandes
331. *Digitalis ferruginea* L. subsp. *feruginea*
332. *Veronica polita* Fries
333. *Veronica beccabunga* L.
334. *Veronica chamaedrys* L.
335. *Euphrasia pectinata* Ten.
336. *Parentucellia viscose* (L.) Caruel
337. *Bellardia trixago* (L.) All.

OROBANCHACEAE

338. *Orobanche nana* Nöe ex Beck.
339. *Orobanche minor* Sm.

VERBENACEAE

340. *Verbena officinalis* L.

LABIATAE(Lamiaceae)

341. *Ajuga reptans* L.
342. *Ajuga chamaepitys* (L.) Schreber subsp. *cypria* P. H. Davis
343. *Teucrium scordium* L. subsp. *scordium*
344. *Teucrium chamaedrys* L.subsp. *chamaedrys*
345. *Lamium purpureum* L. var. *purpureum*
346. *Lamium album* L.
347. *Scutelleria galericulata* L.
348. *Leonurus marrubiastrum* L.
349. *Stachys byzantine* C. Koch
350. *Stachys annua* (L.) L.subsp. *annua* var. *annua*
351. *Stachys maritima* Gouan
352. *Stachys sylvatica* L.
353. *Melissa officinalis* L.subsp. *officinalis*
354. *Prunella vulgaris* Bornm.
355. *Prunella orientalis* Bornm.
356. *Prunella laciniata* (L.)
357. *Origanum vulgare* L. subsp. *viride (*Boiss.*) Hayek*
358. *Satureja hortensis* L.
359. *Galiopsis ladanum* L.

360. *Calamintha nepeta* (L.) *Savi*, subsp. *glandulosa* (Req.) P. W. Ball

361. *Clinopodium vulgare* L.subsp. *vulgare*

362. *Micromeria myrtifolia* Boiss. & Hohen

363. *Mentha pulegium* L.

364. *Mentha aquatica* L.

365. *Mentha longifolia* (L.) Hudson subsp. *typhoides* (Briq.) Harley var. *tythoides* (Briq.) Harley

366. *Mentha spicata* L. subsp. *spicata*

367. *Lycopus europaeus* L.

368. *Salvia tomentosa* Miller

369. *Salvia verbenaca* L.

PLANTAGINACEAE

370. *Plantago major* L. subsp. *major*

371. *Plantago coronopus* L.subsp. *comutata* (Guss.) Pilger

372. *Plantago lanceolata* L.

373. *Plantago logopus* L.

374. *Plantago scabra* Moench

THYMELAEACAE

375. *Daphne pontica* L.

LAURACEAE

376. *Laurus nobilis* L.

ELAEAGNACEAE

377. *Hippophae rhamnoides* L. subsp. *Caucasica* Rousi

SANTALANACEAE

378. *Osyris alba* L.

LORANTHACEAE

379. *Viscum album* L.subsp. *album*

ARISTOLOCHIACEAE

380. *Aristolochia clematis* L.

EUPHORBIACEAE

381. *Mercurialis annua* L.

382. *Euphorbia peplis* L.

383. *Euphorbia cardiophylla* Boiss. & Heldr.

384. *Euphorbia oblongata* Griseb.

385. *Euphorbia palustris* L.

386. *Euphorbia villosa* Waldst & Kit. ex Willd

387. *Euphorbia pubescens* Vahl.

388. *Euphorbia platyphyllos* L.

389. *Euphorbia valerianifolia* Lam.

390. *Euphorbia helioscopia* L.

391. *Euphorbia exigua* L.

392. *Euphorbia peplus* L. var. *peplus*

393. *Euphorbia paralias* L.

394. *Euphorbia terracina* L.

395. *Euphorbia lusida* Waldst & Kit.

396. *Euphorbia amygdaloides* L. var. *amygdaloides*

URTICACEAE

397. *Urtica dioca* L.

398. *Parietaria judaica* L.

MORACEAE

399. *Ficus carica* L.subsp.*carica*

ULMACEAE

400. *Ulmus minor* Miller subsp. *canescens* (Melville) Browicz& Zielinski

401. *Celtis australis* L.

JUGLANDACEAE

402. *Juglans regia* L.

PLATANACEAE

403. *Platanus orintalis* L.

FAGACEAE

404. *Fagus orientalis* Lipsky

405. *Castanea sativa* Miller

406. *Quercus hartwissina Steven*

407. *Quercus petraea* (Mattuschka) Liebl.subsp.*iberica* (Steven ex Bieb.) Krassiln

408. *Quercus cerris* L. var. *cerris.*

CORYLACEAE

409. *Carpinus betulus* L.

410. *Carpinus orientalis* Miller

411. *Corylus avellana* L. var. *avellana*

BETULACEAE

412. *Alnus glutinosa* (L.) *Gaertner* subsp. *glutinosa*

SALICACEAE-

413. *Salix caprea* L.

414. *Salix alba* L.

415. *Populus nigra* L.subsp. *nigra*

416. *Populus tremula* L.

RUBIACEA

417. *Sherardia arvensis* L.

418. *Asperula involucrate* Vahlenb

419. *Asperula sticta* Boiss. subsp.*latibracteata* (Boiss.) Ehrend.

420. *Galium odoratum* (L.) Scop.

421. *Galium debile* Desf.

422. *Rubia peregrina* L.

Altsınıf: **MONOCOTYLEDONEAE**

ALISMATACEAE

423. *Baldellia ranunculoides* (L.) Parl.

424. *Alisma plantago-aquatica* L.

425. *Sagittaria sagittifolia*

HYDROCHARİTACEAE

426. *Najas marina* L.

POTAMOGETONACEAE

427. *Potamogeton natans* L.

428. *Potamogeton pectinatus* L.

RUPPIACEAE

429. *Ruppia cirrhosa* (Petagna) Grande

BUTOMACEAE

430. *Butomus umbellatus* L.

LEMNACEAE

431. *Lemna minor* L.

ARACEAE

432. *Arum maculatum* L.

433. *Arum euxinum* R. Mill.

LILIACEAE

434. *Smilax excels* L.

435. *Ruscus aculeatus* L. var. *aculeatus*-

436. *Ruscus hypoglossum* L.

437. *Asparagus officinalis* L.

438. *Allium kastambulense Kollman*

439. *Allium scadoprassum* L. subsp. *jujlae* (Vved.) Stearn

440. *Scilla bifolia* L.

441. *Scilla autumnalis* L.

442. *Ornithogalum sigmoideum* Freyn & Sint.

443. *Ornithogalum ortophyllum* Ten.

444. *Ornithogalum nivale* Boiss.

445. *Muscari armeniacum* Leichtlin ex Baker

446. *Muscari neglectum* Guss.

447. *Polygonatum multiflorum* (L.) All.

448. *Fritillaria pontica* Wahlenb.

AMARYLLIDACEAE

449. *Leucojum aestivum* L.

450. *Pancratium maritimum* L.

IRIDACEAE -

451. *Iris pseudacorus* L.

ORCHIDACEAE

452. *Serapia svomeracea* (Burm.) Briq. subsp.*orientalis* Greuter

453. *Orchis tridentata Scop.*

454. *Orchis papillionacea* L. var. *papillionacea*

455. *Orchis anatoliaca* Boiss.

456. *Orchis laxiflora* Lam.

457. *Limodorum abortivum* (L.) Sw.)

458. *Neottia nidus –avis* (L.) L. C. M. Rich.

459. *Dactylorhiza romana* (Seb.) Soò. subsp.*romana*

DIOSCOREACEAE

460. *Tamus communis* L.subsp. *communis*

SPARGANIACEAE

461. *Sparganium erectum* L. subsp. *erectum*

TYPHACEAE

462. *Typha domingensis* Pers.

JUNCACEAE

463. *Juncus acutus* L.

464. *Juncus littoralis* C. A.Meyer.

465. *Juncus heldreichianus* Mason ex Parl.subsp. *heldreichianus*

466. *Juncus maritimus* L.

467. *Juncus effusus* L.

468. *Juncus tenuis* Willd.

469. *Juncus conglomerates* L.

470. *Luzula forsteri* (Sm.) DC.

471. *Luzula pallescens* (Wahlenb.) Beser

CYPERACEAE

472. *Cyperus longus* L.

473. *Cyperus capitatus* Vandelli

474. *Cyperus fuscus* L.

475. *Juncellu spannonicus* (Jacq.) C.B.Clarke

476. *Eleocharis palustris* (L.) Roemer & Schultes

477. *Schoenoplectus lacustris* (L.) Pallasubsp.*lacustris*

478. *Scirpoides holoschoenus* (L.) Sojak

479. *Schoenus nigricans* L.

480. *Carex otrobae* Podp.

481. *Carex difulsa* Stokessubsp.*leersii* (Keucker) W.Koch

482. *Carex divisa* Hudson

483. *Carex flacca* Schreber

484. *Carex extense* Good.

485. *Carex pallescanis* L. var. *chalcodeta* (V. Krecz) Ö. Nilsson

486. *Carex tomentosa* L.

GRAMINEA *(Poaceae)*

487. *Brachypodium sylvaticum* (Hudson) P. Beauv.

488. *Elymus elongatus* (Host) Runemark. subsp.*elangatus*

489. *Elymus repens* (L.) Gould. subsp. *repens*

490. *Elymus farctus* (Viv.) Runemark ex Melderis subsp.*bessarabicus* (Sāvul. & Rayss) Melderis var. *bessarabicus*

491. *Aegilops geniculata Roth*
492. *Hordeum murinum* L. subsp. *glaucum* (Steudel) Tzvelev.
493. *Hordeum bulbosum* L.
494. *Bromus squarrosus* L.
495. *Bromus diandrus* Roth
496. *Avena fatua* L. var. *fatua*
497. *Rostraria cristata* (L.) Tzvelev subsp. *cristata*
498. *Aira elegantissima* Schur. subsp. *elegantissima*
499. *Holchus lanatus* L.
500. *Ammophila arenaria* (L.) Link subsp. *arundinacea* H. Lindb.
501. *Agrostis capillaries* L. var. *capillaris*
502. *Agrostis stolonifera* L.
503. *Gastridium ventricosum* (Govan) Schinz & Thell.
504. *Lolium perene* L.
505. *Lolium temulentum* L.
506. *Catapodium rigidum* (L.) C. E. Hubbard ex Dony subsp. *rigidum*
507. *Poa bulbosa* L.
508. *Dactylis glomerata* L.subsp. *lobata* (Drej.)Lindb.
509. *Cynosurus cristatus*L.
510. *Briza media* L.
511. *Briza minor* L.
512. *Arundo donax* L.
513. *Phragmites australis* (Cav.) Trin. ex Steudel
514. *Cynodon dactylon* (L.) Pers. var. *dactylon*
515. *Tragus racemosus* (L.) AlI.
516. *Echinochloa crus-galli* (L.) P. Beauv
517. *Digitaria sanguinalis* (L.) Scop.
518. *Paspalum paspalodes* (Michx) Scribner
519. *Setaria viridis* (L.) P. Beauv
520. *Setaria glauca* (L.) P. Beauv
521. *Sorghum halepense* (L.) Pers. var. *halepense*
522. *Bothriochloais chaemum* (L.) Keng

Some of the forest plant, flooded ash tree forest, lake and wetland and sandy dune photo taken in Sarikum NCA (**Figure 1-10**).



Fagus orientalis



Quercus cerris



Carpinus betulus



Carpinus orientalis



Castanea sativa



Acer campestre

Figure 1. Some of the forest plants in Sarikum NCA.



Ulmus minor



Sorbus aria



Quercus petraea



Daphne pontica



Ilex aquifolium



Celtis australis

Figure 2. Some of the forest plants in Sarikum NCA



Stellaria holostea



Scilla bifolia



Cyclamen coum



Lamium purpureum



Orobanche minor



Primula vulgaris



Ruscus aquleatus

Figure 3. Some of the forest plants in Sarikum NCA



Cerastium glomeratum



Polygonatum multiflorum



Trachystemon orientalis



Hypericum calycinum



Helleborus orientalis



Bellis perennis

Figure 4. Some of the forest plants in Sarikum NCA



Fraxinus angustifolia



Alnus glutinosa



Cornus sanguinea



Salix alba



Potentilla reptans



Cichorium intybus

Figure 5. Some of the flooded ash tree forest plants in Sarikum NCA



Crataegus monogyna



Ajuga reptans



Veronica anagallis-aquatica



Verbena officinalis



Carex pendula



Bidens cernua

Figure 6. Some of the flooded ash tree forest plants in Sarikum NCA



Mentha aquatica



Arundo donax



Sparganium erectum



Alisma plantago-aquatica



Ranunculus trichophyllus



Leucojum aestivum

Figure 7. Some of the, lake and wetland plants in Sarikum NCA



Iris pseudacorus



Caltha palustris & Lemna minor



Pulicariadys enterica



Juncus littoralis



Typha latifolia



Potamogeton natans

Figure 8. Some of the lake and wetland plants in Sarikum NCA



Cionura erecta



Hippophae rhamnoides



Calystegia soldanella



Eryngium maritimum



Otanthus maritimus



Pancratium maritimum

Figure 9. Some of the, sany dune in Sarikum NCA



Beta maritima



Euphorbia paralias



Jurinea kilaea



Polygonum maritimum



Ammophila arenaria



Verbascum degenii

Figure 10. Some of the sany dune plants in Sarikum NCA

ANNEX 2. EDIBLE PLANTS, AROMATIC AND MEDICINAL PLANTS AND THEIR USE

(All data presented here are 2007 Spring and Autumn Data taken from the Regional Directorate)

Medicinal and aromatic plants are valuable components of Türkiye's biodiversity. Its ecological landscape provides suitable environment for the natural growth of medicinal plants. There are two ecological zones where several species of economically important plants are exploited commercially. We describe 28 plants of medicinal and economic value including their commercial importance, mode of collection and important uses. This section explores the species of plants literature search has revealed a number of sources which provide information on this aspect.

Allium schoenoprasum Chives

Leaves used for garnish and herb.

*Apium graveolen***s** Celery

Leaf stalks or petioles edible

Foeniculum vulgare Fennel

Edible petioles; seeds used like anise for liquoriceflavouring in caddy, medicines, perfumes, liqueur and soap; true liquorice from root of a perennial legume

Ilex species Holly

The bright red berries of Europe species are used for wreaths and colourful decorations *Matricaria chamomilla* German Chamomile

From dried flower heads; weedy species called pineapple weed

Carthamus tinctorius Safflower.

Oil from seeds

Cichoriumintybus Chicory.

Taproot roasted and ground, used as an adulterant in coffee Jaundic, Epilepsy, Mouth disease

Cynara cardunculus Cardoon or Thistle Artichokes

Globe artichoke derived from this species and may be only be a variety rather than a separate species; inner leaves and petioles (leaf stalks) are edible; flower heads used for dry flower arrangements

Silybum marianum Milk Thistle

A prickly herb used to detoxify the liver.

Isatis tinctoria (I. arenaria) Woad

Important blue dye used in Europe during 1500s and 1600s; the glycoside dye indicant in leaves; one of dyes used for their green clothing.

Melilotus albus, and *M. officinalis* White, and Yellow Sweet Clover

Wet or mouldy sweet clover contains the anticoagulant compound dicoumarin (a double phenolic ring); dicoumarin is used in rat poison; it is formed by the union of 2 single-ring coumarin molecules; coumarone is found in fresh clover & alfalfa and produces the aroma of new mown hay.

Hypericum perforatum St. John's-wort

Flowers used as herb to treat symptoms of mild depression and mood swings;

Melissa officinalis- Balm or Lemon Balm

Leaves used as flavouring for salads, soups and tea.

Ficus carica-Fig

Edible Hundreds of cultivated varieties, some requiring a pollinator wasp

Olea europaea Olive

Native to the Mediterranean region; fresh olives (drupes) are extremely bitter due to oleuropein, a phenolic glucoside; olives soaked in lye (sodium hydroxide) to remove the bitter oleuropein; olives picked green are oxidized in air to produce black colour; green olives kept submerged will retain green colour; pitted green olives often stuffed with pimento, a bright red; unlike most unsaturated plant oils which come from seeds, monounsaturated olive oil is obtained from the pulp or mesocarp of the fruit; virgin olive oil is obtained from the 1st pressing.

Phytolacca americana Pokeweed or Poke Salet

Native American weed or potherb; the young leaves are cooked and eaten like spinach

Plantago spp. Plantain or Psyllium

The thickening and swelling of soluble fiber extracts such as Metamucil and Hydrocil involves imbibitions. These plant products contain a mucilaginous gum derived from the husks of plantain seeds Plantain powder readily absorbs water and forms a smooth bulky mass that moves through the intestinal tract. Insoluble fibber comes from the indigestible cellulose cell walls of fruits and vegetables. Both types of fibber are beneficial in maintaining a healthy colon, particularly in older adults with diverticulosis. Digestion, Dysentery, Constipation

Portulaca oleracea Purslane

Common prostrate weed with edible, succulent leaves and stems; a C-4 plant, grows rapidly during hot summer months in Türkiye

Mesipulus germanica Medlar

A small, deciduous tree native to Europe and Asia Minor; the ripe, apple-shaped pomes are eaten raw and used in preserves

Rubia tinctorum Madder

Brilliant scarlet dye from roots-the red flags of Turkish colour with this brilliant crimson dye.

Populus alba White Poplar;

Uses include a soft wood for boxes, etc. and as pulpwood in manufacture of paper.

Digitalis ferruginea Fox glove

Heart stimulant (cardiac glycoside)- digoxin and digitoxin from leaves.

Datura stramonium Jimson weed

Source of drug stramonium from leaves and flowering tops; contains the alkaloids hyoscyamine, scopolamine and atropine; used liquid from crushed roots of *D. stramonium*, for hallucinogenic effect during puberty ritual; drug is very poisonous and is dangerous.

Hyoscyamus niger

Leaves and seed, Used for narcotic purposes, also used in asthma and whooping cough. Stomach pain,

Hippohae rhamnoides

Epistaxeis, tonic

Mentha lonifolia

Vomiting, digestion, Carminative

Urtica dioica

Laxative Decoction of leaves useful in rheumatic pain, while paste of peeled leaves and twigs applied externally for skin disease

ANNEX 3. DUNE VEGETATION

(All data presented here are 2007 Spring and Autumn Data taken from the Regional Directorate)

Sandy beach ecosystems can be divided into three zones: The surf zone, where waves break; the beach, which includes the intertidal and backshore zones; the dunes, made up of small, recently formed foredunes and large, established backdunes (16, 17, 19 and 26). In the sea, waves and currents continually move sediment along the shore, as well as on- and offshore, in a process known as littoral transport. On land, wind blows sand from the beach into the dunes, called aeolian transport. When sand blown up the beach by onshore winds is trapped by plants growing near the driftline, it forms mounds called hummocks, which initiate the development of foredunes. Sandy beach systems therefore comprise a marine wave-driven ecosystem and a terrestrial wind-driven ecosystem that together make up the littoral active zone - the area in which sand exchange occurs. While sand exchange is an ongoing process, some seasonal effects linked to weather conditions are noticeable. During stormy weather, rough seas erode sand away from the beach and foredunes and deposit it as a sandbar offshore. When calm conditions return, gentle waves carry the sand back to rebuild the beach. In this way, the beach undergoes seasonal cycles of erosion and accretion.

Around Sarıkum NCA, dune vegetation along the Sarıkum coast shows some variation based on the dune's distance from the sea, its stability, its ground water conditions, biotic factors, the amount of organic matter, pH and biotic factors. Plant growth on beaches is limited to a few species. The plants that are able to grow here either need protection in the dunes from the harsh forces of the wind, or they have to be very well-adapted to the shifting sand, temperature, salt, and limited water supply. The Sarkum NCA was dominated by herb vegetation although shrub vegetation is seen rarely. Floristic composition of these vegetation types usually changes due to the distance from the sea more than climatic and local differences (**Figure 1**). The vegetation of the Sarkum NCA was separated in to three zones from coast to inner parts horizotally (20–100; 100–300; 300–1000).

The first zone was characterized by halophytes which tolerant to the severity of wind and dune movements. Some of these halophytes are *Calystegiasoldanella, Cakile maritima, Salsola ruthenica, Eryngium maritimum* and *Elymus elongatus* subsp. *elongatus.* Second and third zones usually were involved within each other. The number and density of halophytes were gradually decrased in second zone due to lower salinity and presance.

Second zone is characterized by *Euphorbia paralias, Otanthus maritimus, Medicago marina, Daucus broteri* and *Cyperus capitatus*. Third zonehas a rich flora as compared to the other zones because of it has stabl and damp dunes. The vegetation exhibits two layers as shrub and herb layers in the third zone. Shrub layer is charecterized by *Hippophaerhamnoides*subsp.*caucasica, Rubus canescens* var. *canescens*and *Paliurus spina-christi.*Herb layer is charecterized by *Anthemis tinctoria, Teucrium chamaedrys, Plantago scabra, Scirpoidesholoschoenus* and *Pulicariadysenterica* (**Figure 1**).

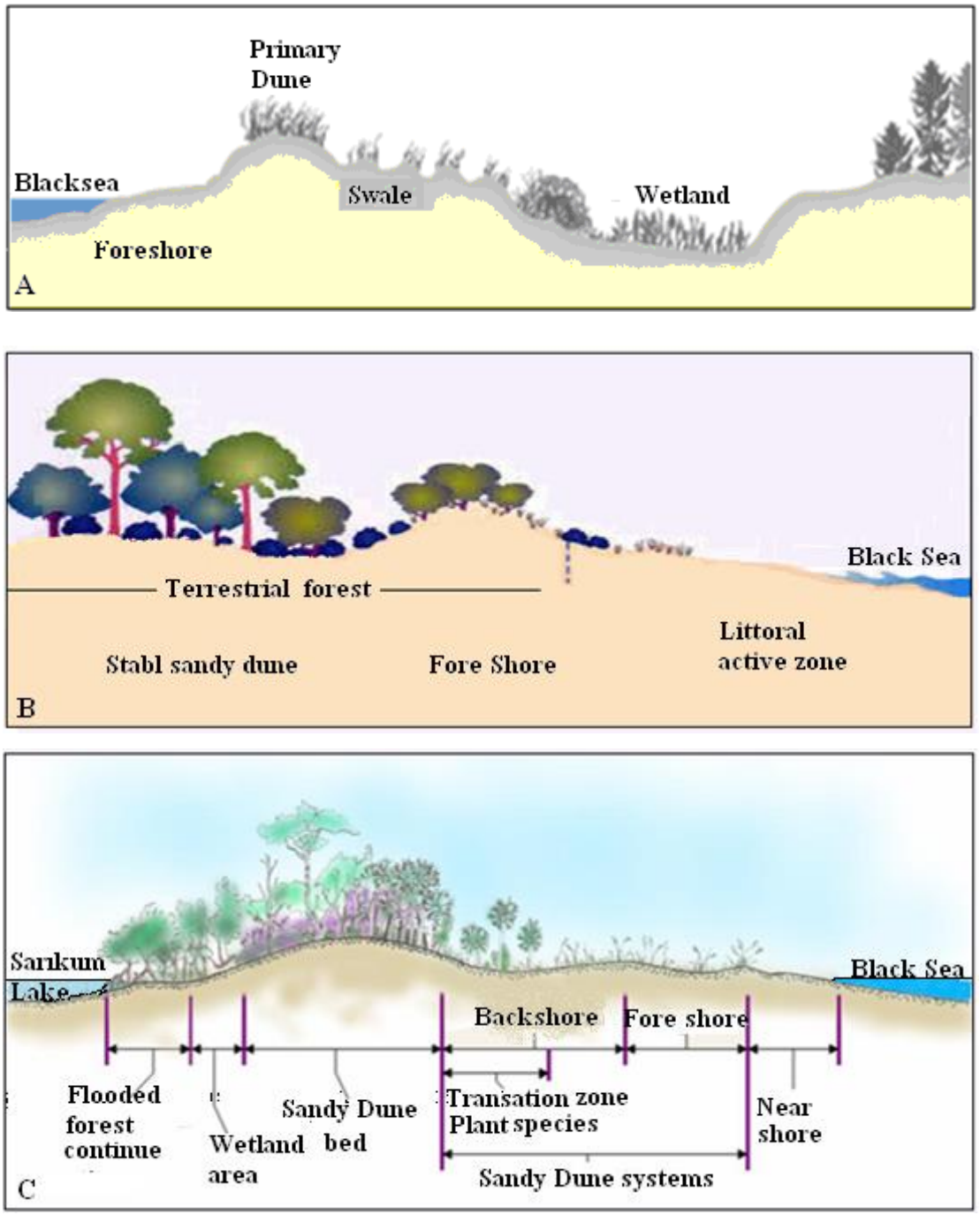


Figure 1. The vegetation of the Sarıkum NCA zones from coast to inner parts horizontaly

A: The vegetation of the Black Sea to Sütleğen pass;

B: The vegetation of the Black Sea to Sarikum village;

C: The vegetation of the Black Sea to Sarikum Lake.

Associations in the Sarikum NCA

a-*Otanthus maritimus- Eryngium maritimum* association

This association is widespread in first zones around (20-100m 1-2m height). The characteristic and differential species of the association are *Otanthus maritimus, Eryngium maritimum* and *Maresia nana*. The association consists of herb species which are 10–50 cm in height. Total coverage of the association is between 50–70 %. The number of species in quadrats changes 10–15 (16).

Floristic composition of the association is AMMOPHILION ARUNDINACEAE is represented by *A. arenaria* subsp. *arundinacea, E. elongatus* subsp. *elongatus, E. farctus* subsp. *besserabicus, M. marina* and *C. capitatus,* AMMOPHILETALIA ARUNDINACEAE order, AMMOPHILETEA ARENARIA class are represented by, *Pancratium maritimum,E. paralias, Salsola ruthenica, Calystegia soldanella C. acutum* subsp. *acutum* and *J. kilaea* respectively (**Figure 2**).

b- *Ammophila arenaria* subsp. ***arundinacea-Elymus elongatus*** subsp.***elongates* association**

This association is widespread in first and second zones around. The characteristic and differential species of the association are *Ammophila arenaria* subsp. *arundinacea, Elymus elongatus* subsp. *elongatus* and *Alyssum stribrny*. The association consists of herb species which are 5–80 cm in height. Total coverage of the association is between 60–80 % .The number of species in quadrats changes 11–17.

Floristic composition of the association is quite rich AMMOPHILION ARUNDINACEAE is represented by *Eryngium maritimum, Cyperus capitatus, Otanthus maritimus, Medicago marina, Elymus farctus,* AMMOPHILETALIA ARUNDINACEAE order, AMMOPHILETEA ARENARIA class are represented by, *Pancratium maritimum, E. paralias, Salsola ruthenica, Jurinea kilaea, Cynachum acutum* respectively. EUPHORBION PEPLIS allilance and CAKILETEA MARITIMAE class is represented by *Cakile maritima, Euphorbia peplis* and *Polygonum maritimum* (**Figure 3**).

c- *Juncus littoralis-Scirpoides holoschoenus* association

This association is widespread in third zones around (300-1000 m). The characteristic and differential species of the association are *J. littoralis, S.holoschoenus.* The association consists of herb species which are 25-90cm in height. Total coverage of the association is between 70–80 %. The number of species in quadrats changes 15–25.

Floristic composition of the association is AMMOPHILETEA ARENARIA class are represented by, *M. marina, E. paralias, C. capitatus, S. ruthenica, E. maritimum* and *P. maritimum* respectively.



Figure 2. Second zone is characterized by *Euphorbia paralias, Medicago marina,*



Figure 3. *Otanthus maritimus-Eryngium maritimum* association



Figure 4. *Ammophila arenaria -Elymus elongates* association



Figure 5. *Juncus littoralis-Scirpoides holoschoenus* association

ANNEX 4. LIST OF FUNGI SPECIES IN SARIKUM NCA

(All data presented here are 2007 Spring and Autumn Data taken from the Regional Directorate)

Afyon et.al. (2004) published an updated list, along with information on the occurrence, taxonomic status, distribution, of Fungi in Sinop. We adapted that work and reproduce it here. The Sarıkum fungi list contains 102 fungi species in 26 families**.**

1-Agaricaceae

1. *Agaricus bisporus* (Lge.) Sing.
2. *Agaricus placomyces* Peck
3. *Agaricus silvicola* (Vitt.) Sacc.

2-Amanitaceae

4. *Amanita citrina* (Schaeff.) S.F.Gray
5. *Amanita excelsa* (Fr.) Bertillon
6. *Amanita gemmata* (Fr.) Bertillon
7. *Amanita pantherin*a (DC & Fr.) Krombh.
8. *Amanita rubescen*s Pers.: Fr.
9. *Amanita vaginata* (Bull.: Fr.) Quél.

3-Bolbitiaceae

10. *Agrocybe cylin*dracea (DC & Fr.) Mre.
11. *Agrocybe dura* (Bolt.: Fr.) Sing.

4-Boletaceae

12. *Boletus calopu*s Fr.
13. *Boletus edulis* Bull.: Fr.
14. *Boletus reticula*tus Schaeff.
15. *Leccinum carp*ini (R.Schulz) Mos.
16. *Leccinum nigre*scens (Richon & Roze) Sing.
17. *Leccinum onychinum* Watling nom prov
18. *Leccinum scab*rum (Bull.: Fr.) S.F.Gray
19. *Suillus bovinus* (L.: Fr.) O.Kuntze
20. *Xerocomus chrysenteron* (Bull.) Quél.

5-Cantharellaceae

21. *Cantharellus cibarius* Fr.
22. *Cantharellus friesii* Qu.l
23. *Cantharellus ferruginescens* Orton

6-Clathraceae

24. *Clathrusruber* Micheli: Pers.

7-Coprinaceae

25. *Coprinus comatu*s (Mull.: Fr.) S.F.Gray
26. *Coprinus congre*gatus (Bull.: St. Amans) Fr
27. *Coprinus micace*us (Bull.: Fr.) Fr.
28. *Coprinus niveus* (Pers.: Fr.) Fr.
29. *Coprinus picace*us (Bull.: Fr.) S.F.Gray
30. *Paneolus specio*sus Orton
31. *Paneolus sphinc*trinus (Fr.) Quél.
32. *Psathyrella hydr*ophila (Bull.: Mer.t) Maire

8-Corticiaceae

33. *Steccherinum ochraceum* (Pers. apud. Gmelin:Fr.) S.F.Gray
34. *Stereumochraceo-flavum* (Schw.) Ellis

9-Cortinariaceae

35. *Cortinarius cinnamomeus* (L.: Fr.) Fr
36. *Cortinarius vibratilis* (Fr.) Fr.
37. *Hebeloma mesophaeum* (Pers.: Fr.) Quél.
38. *Inocybebre sadola*e Mass

10-Entolomataceae

39. *Entoloma sericeum* (Bull. ex Mer.t) Quél.

11-Ganodermataceae

40. *Ganoderma adspersum* (Schulz.) Donk.
41. *Ganoderma applanatum* (Pers.: Wallr.) Pat.
42. *Ganoderma lucidum* (Fr.) P.Karst.

12-Hygrophoraceae

43. *Hygrophorus poetarum* Heim

13-Hymenochaetaceae

44. *Phellinus nigricans* (Fr.) Karst.

14-Lepiotaceae

45. *Lepiotabrunneo*-incarnata Chodat& Martin
46. *Lepiota cristata* Kumm.
47. *Macrolepiota pr*ocera (Scop.: Fr.) Sing.
48. *Macrolepiota rh*acodes (Vitt.) Sing.

15-Lycoperdaceae

49. *Calvatia excipuliformis* (Pers.) Perdeck
50. *Calvatia utrifomis* (Bull.: Pers.) Jaap.
51. *Lycoperdon mammaeforme* Pers.: Pers.
52. *Lycoperdon pyriforme* Schaeff.: Pers.

16-Nidulariaceae

53. *Crucibulum la*eve (Huds.) Kambly
54. *Cyathus olla B*atsch: Pers.

17-Paxillaceae

55. *Paxillus involutus* (Batsch: Fr.) Fr.

18-Pleurotaceae

56. *Pleurotus ostrea*tus (Jacq.: Fr.) Kumm.
57. *Pleurotus pulmo*narius Fr.
58. Pluteaceae
59. *Pluteus leonin*us (Schaeff.: Fr.) Kumm.
60. *Pluteus salicin*us (Pers.: Fr.) Kumm.
61. *Volvoriella bombycina* (Schaeff.: Fr.) Sing.

19-Polyporaceae

62. *Fomes fomentarius* (L.: Fr.) Fr.
63. *Fomitopsis rosea* (Alb. & Schw.) Karst.
*Phyllotopsis nidul*ans (Pers.: Fr.) Sing.
64. *Polyporus ciliatu*s Fr.
65. *Polyporus varius* Pers.: Fr.
66. *Pycnoporus cinnabarinus* (Jacq.: Fr.) Karst.
67. *Trametes pubesc*ens (Schum.: Fr.) Pil.
68. *Trametes versico*lor (Fr.) Pil.

20-Ramariaceae

69. *Ramaria aur*ea (Schaeff.: Fr.) Quél.
70. *Ramaria flav*a (Schaeff.: Fr.) Quél.
71. *Ramaria lute*a (Vitt.) Schild

21-Rhizopogonaceae

72. *Rhizopogon roseolus* (Corda) T.M.Fries

22-Russulaceae

73. *Lactarius decipiens* Qu.
74. *Lactarius piperatus* (L.: Fr.) S.F.Gray
75. *Lactarius vietus* Fr.
76. *Lactarius volemus* Fr.
77. *Russula adulterina* Fr.
78. *Russula aeruginea* Lindblad: Fr.
79. *Russula albonigra* Krombh.
80. *Russula amoena* Qu.l
81. *Russula anthracina* Romagn
82. *Russula atropurpurea* (Krombh.) Britz
83. *Russula betularum* (Hora) Romagn.
84. *Russula brunneoviolacea* Crawshay
85. *Russula cyanoxantha* Schaeff.: Fr.
86. *Russula farinipes* Romelli ap. Britz.
87. *Russula fragilis* (Pers.: Fr.) Fr
88. *Russula grise*a (Pers.: Secr.) Fr.

89. *Russula ionochlora* Romagn

90. *Russula laurocerasi* Melzer

91. *Russula livescens* (Batsch) Qu.l

92. *Russula mairei* Sing.

93. *Russula nigricans* (Bull.) Fr.

94. *Russula olivescens* (Pers.) Bres.

95. *Russula parazurea* Schaeff.

96. *Russula persicina* Krombh.: Melz. &Zv.

97. *Russula rosac*ea Pers.: S.F.Gray

98. *Russula vinos*a Lindblad

23-Schizophyllaceae

99. *Schizophyllum commune* Fr.: Fr.

24-Sclerodermataceae

100. *Scleroderma areolatum* Ehrenb.

25-Strophariaceae

101. *Hypholoma fasciculare* (Huds.Fr.) Kumm.

26-Tremellaceae

102. *Sebacina incrustans* (Fr.) Tul.



Agaricus excellens



Amanita vaginata



Boletus edulis



Cortinarius delibutus



Ramaria flarva



Rhizopogon roseolus

Figure 1. Some of the fungi taxa in Sarikum NCA



Lactarius deliciosus



Tricholo maustale



Clitopilus prunulus



Polyporus squamosus





Figure 2. Some of the fungi taxa in Sarikum NCA

ANNEX 5. SARIKUM FAUNA AND ECOSYSTEM[7]

VERTEBRATES

Introduction

Monitoring animal communities in terrestrial ecosystems is important component elements in an ecosystem structure; due to the fact that they are in a permanent and close contact with most important man-made factors that has an impact on the environment.

For the monitoring of wildlife in an environmental includes routine surveillance over the major taxonomic groups of animals distributed in and around Sarıkum region (amphibian,reptiles, birds and mammals), parameters of inhabitation, state and size of population, population distribution at the studied territory, dominant population have been determined. During field surveys reproduction and biodiversity criterias have been applied and national and international criteria of nature protection, (IUCN, BERN, CITES), endemism status have been updated.

This was an ongoing study for one year and it performed to determine the status of the diversity for further analysis. The studies were carried out in January 2023 and May 2023.

The data is tabulated and evaluated as shown below. All the known species were characterized in term of national and international protection criteria (IUCN, BERN, CITES andendemism status).

Data was gathered by the vertebrates and invertebrates experts at the project site, its impact are and at the terrestrial ecosystem in which the project site is found and also conversations were made with the local residents and hunters. Moreover, former studies about the terrestrial invertebrates and vertebrates at the project site and ecosystem areas in which the project site is included were evaluated. Data pertaining to burrow, hair, trace, faeces, photograph, voice, bone, teeth and skin of the vertebrates and invertebrates that were collected on site were used in the identification of the species living at the area.

The vertebrates and invertebrates fauna present at the project area were determined by the evaluation of the outcomes of these studies together with the existing literature. 332 vertebrate species are determined to be living at the project site and its vicinity.

The project area is mainly covered by *Pinus maritima* (Pine Bark) and *Pinus pinea* (Stone Pine) forests, which are formed by plantation. *Pinus maritima* covers approximately 80% of the project

[7]All photos are taken by Mustafa Sozen on 26-27 January 2023.

area, while *Pinus pinea* covers approximately 5 % of the project area. As for the remaining 15%, it generally consists of 50-200 m wide sand dune, rocky land and shrubs between the shore and the forestry area. Furthermore, there are aquatic ecosystems within the forest and its clearings, the deciduous trees near the rivers and the plants in the form of trees and shrubs composed of evergreen maquis components. The terrestrial ecosystem suddenly rises from the sea in the vicinity of Haciali Barrack (northeast of the project area) and cliff rocks and seaside cliffs are formed. The herb and shrub formation are more widely spread at this region. Since the area has inclinations and became infertile due to the washing of the soil, it is not suitable for growing of forest. The habitat types of project area according to the EUNIS are given here as fallows:

B1.31: Embryonic shifting dunes
B3.3: Rock cliffs, ledges and shores, with angiosperms
C3.23: Typha beds
F6.4: Black Sea garrigues
G1.A1C: Southeastern European *Quercus* - *Carpinus betulus* forests
G1.1: Riparian and gallery woodland, with dominant *Alnus, Betula, Populus* or *Salix*
G1.33: Mediterranean riparian *Fraxinus* woods
G3. F12 - Native pine plantations
I: Regularly or recently cultivated agricultural, horticultural and domestic habitats

During site survey in May 2023, binoculars, Canon 1D Mark IV camera with several lenses (500 mm f4 teleobjective + 1.4 C for the birds, 100 mm f/2.8 objective for macro shots and 11-16 mm fot landscape photos), bat detectors, and capture traps were used. During the field work, in order to determine the vertebrate species, the experts made observations at stone bottoms, rock clefts, different mediums such as old structures and forest areas where these livings likely to be found.

The literature utilized in the identification of the species at the project site is given in References section.

The categories and their abbreviations given in the tables are as follows:
BERN (Bern Convention)
Appendix - II: Strictly Protected Fauna Species (SPFS)
Appendix - III: Protected Fauna Species (PFS)

IUCN (International Union for Conservation of Nature and Natural Resources) Red List Categories (2022 ver. 15.1)

EX (Extinct): There is no reasonable doubt that the last individual has died.
RE (Regionally Extinct)
EW (Extinct in the Wild): Only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range.

Risk Categories
CR (Critically Endangered): Species considered to be facing an extremely high risk of extinction in the wild.
EN (Endangered): Species considered to be facing a very high risk of extinction in the wild.
VU (Vulnerable): Species considered to be facing a high risk of extinction in the wild.

Low Risk Categories
NT (Near Threatened): Species close to qualifying for or is likely to qualify for a threatened category in the near future.
LC (Least Concern): Widespread and abundant species.
DD (Data Deficient): Species for which there is inadequate information.
NE (Not Evaluated): Species that has not yet been evaluated against the criteria.
END (Endemic)
NA (Not Applicable for IUCN)

CITES Categories
Appendix-1 List includes species that are threatened with extinction and thus international trade in specimens of these species is prohibited, except when the purpose of the import is not commercial.
Appendix-2 List includes species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled.
Appendix-3 List includes species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation.
2022-2023 Central Game Commission (MAK) Decrees
Appendix-I: List of game animals protected by MAK.
Appendix-II: List of game animals whose hunting is allowed for certain periods for 2022-2023 season.

Habitats Directive: Council Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora dated May 21, 1992

Annex-I: Natural habitat types of community interest whose conservation requires the designation of special areas of conservation

Annex-II: Animal and plant species of community interest whose conservation requires the designation of special areas of conservation.

Annex-III: Criteria for selecting sites eligible for identification as sites of community importance and designation as special areas of conservation

Annex-IV: Animal and plant species of community interest in need of strict protection

Annex-V: Animal and plant species of community interest whose taking in the wild and exploitation may be subject to management measures

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the Conservation of Wild Birds: Acts adopted before 1 December 2009 under the EC Treaty, the EU Treaty and the Euratom Treaty)

The birds in the scope of EU list are listed as Annex I, Annex II (Part A, Part B); the birds in Annex I are the ones that requires strict protection; while the others are listed in Annex II. The birds of the project site are evaluated as Ann.-I and Ann-IIA, Ann-IIB in the respective following table.

Literature Review

A special publication on the fauna of Akkuyu, the study area, is not found. The studies focusing on the birds of Göksu Delta, found at the east of the study area, constitutes an important part of the literature on the fauna of the region (www.kusbank.org). Various fauna records are found for Silifke, Anamur and Bozyazı Districts in different sources (Doğramacı, 1974; Huş, 1974; Mursaloğlu, 1976; Huş and Göksel, 1981; Kıvanç, 1988; Benda & Horáček., 1998; Kryštufek and Vohralík, 2001, 2005; Karataş, 2009).

In addition to that, many studies (such as Osborn, 1964; Kumerloeve, 1975; Felten et al., 1977; Doğramacı, 1989; Demirsoy, 1996; Heinzel et al., 2001; Baran, 2005; Dijkstra & Lewington, 2006; Yiğit et al., 2006; Baytaş, 2008; Baran et al. 2012), which also cover the study area, present information on the distribution of species and maps.

In this study, the sources used for identification of the species and/or used for literature survey are listed below according to vertebrate and invertebrate groups.

Besides these, the websites having database features such as e-bird (www.ebird.org), Trakuş (www.trakus.org), and Tramem (www.tramem.org) are used to gather information on the fauna of the region.

VERTEBRATES (VERTEBRATA)

Species from four classes of the terrestrial vertebrates were determined, namely mammalians (MAMMALIA), birds (AVES), reptiles (REPTILIA) and frogs (AMPHIBIA).

AMPHIBIA (Frogs, Toads and Salamnders and Newts)

The number of amphibian species detected on site is 7. The information on the Amphibian species is given in **Table 1**; while photographs are presented in **Figure 1.** There are two endemic species among the amphibian species detected at the project area and its impact area.

Protection Status of the Amphibian Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the amphibian species recorded at the project site and its vicinity, 5 species are listed in LC (Least Concern) category, and two Species have not been evaluated yet by IUCN.

According to BERN Convention

As a consequence of the studies carried out, 2 of the amphibian species is in the Protection List in Appendix-II (Strictly Protected Fauna Species) of Bern Convention; 5 species are listed in Appendix-III (Protected Fauna Species).

Table 1. Frog (AMPHIBIA) Species Identified at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Habitat Directive	Endemic
URODELA								
Salamandridae								
Ommatotriton nesterovi	Anadolu şeritlisemenderi	North-western Banded Newt	NE	Ann-III	-	-		Endemic
Triturus anatolicus	Anadolu pürtüklüsemenderi	Anatolian Crested Newt	NE	Ann-III	-	-	-	Endemic
ANURA								
Bufonidae								
Bufo bufo	Siğillikurbağa	Common toad	LC	APP III	--	--	--	
Bufotes viridis	Gecekurbağası	Green Toad	LC	APP III	--	--	Ann-III, IV	
Hylidae								
Hyla orientalis	Ağaçkurbağası	Green Frog	LC	APP II	--	--	Ann-III, IV	
Ranidae								
Pelophylax ridibundus	Ova kurbağası	Euroasian Marsh Frog, Marsh Frog	LC	APP III	--	--	Ann-IV	
Rana dalmatina	Çevik kurbağa	Agile Frog	LC	APP II	--	--	Ann-III, IV	



Figure 1. Photographs of some amphibian Species determined in study area. a. *Bufo bufo*, b. *Rana dalmatina*, c. *Bufotes viridis*, d. *Hyla orientalis*. e. *Pelophylax ridibundus* (@ Sözen).

Reptiles (REPTILIA)

15 species belonging to two order of this group are detected. Two of them belong to turtles (TESTUDINES); while the others belong to scaly reptiles (SQUAMATA) order.

Protection Status of the Reptile Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the reptile species detected at the project site and its vicinity, 7 species is in "LC" (Least Concern) in low risk categories, 6 species are Not Evaluated (NE), one species is "NT" (Near Threatened), and only one species is in VU (Vulnerable) category. This species is *Testudo graeca* (Spur-thighed Tortoise) and by listing as vulnerable (VU) species by IUCN, it is considered as endangered species. However, the population status of the species is rather good in the region and in Türkiye and this category of IUCN is thought to be only valid for Europe.

According to BERN Convention

9 reptile species, whose distribution on site is determined through studies, are included in the Protection Lists of Appendix-II of Bern Convention (Strictly Protected Fauna Species), 5 reptile species are listed in Appendix-III (Protected Fauna Species).

According to CITES Convention

The studies revealed that only *Testudo graeca* are included in Appendix-I of CITES Convention and the trade of these species trade should be closely controlled.

Table 2. Reptile (REPTILIA) Species Detected at the Project Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Habitat Directive	Endemism
TESTUDINES								
Testudinidae								
Testudo graeca	Tosbağa	Mediterranean Spur-thighed Tortoise	VU	APP II	APP II		Ann-II, III, IV	
Emydidae								
Emys orbicularis	BenekliKaplumbağa	European Pond Turtle	NT	APP II	-		Ann-II, III, IV	
SQUAMATA								
Gekkonidae								
Hemidactylus turcicus	Geniş Parmaklı Keler	Mediterranean House Gecko	LC	APP III	-		-	
Anguinidae								
Anguis colhica	Yılanımsı kertenkele	Slow Worm	NE	APP III	-		-	
Pseudopus apodus	Oluklu kertenkele	Sheltopusik	NE	APP II	-		-	
Lacertidae								
Darevskia rudis	Trabzon kertekelesi	Spiny-Tailed Lizard	LC	APP III	-		-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Habitat Directive	Endemism
Lacerta viridis	Yeşil kertenkele	Green Lizard	LC	APP II	-		Ann-III, IV	
Lacerta media	Sivas Kertenkelesi	Three-lined Lizard	LC	-	-		-	
Ophisops elegans	Tarla Kertenkelesi	Snake-eyed Lizard	NE	APP II	-		Ann-III, IV	
Podarcis muralis	Duvar kertenkelesi	Common Wall Lizard	LC	APP II			Ann-III, IV	
Colubridae								
Dolichophis caspius	Hazer yılanı	Caspian Whipe Snake	NE	APP II			Ann-III	
Coronella austriaca	AvusturyaYılanı	Smooth snake	NE	APP II			Ann-III	
Eirenis modestus	Uysal yılan	*Anatolian Dwarf RacerLC*	LC	APP III			Ann-III	
Natrix natrix	YarıSuculYılan	Grass Snake	LC	APP III	-		Ann-III	
Natrix tessellata	Su yılanı	Dice Snake, Tessellated Water Snake	NE	APP II			Ann-III	



Figure 2. Photographs of some reptile species determined in study area. a. *Testudo graeca*, b. *Emys orbicularis*, c. *Hemidactylus turcicus*, d. *Anguis fragilis*, e. *Pseudopus apodus*, f. *Natrix tessellata*, g. *Lacerta viridis*, h. *Natrix natrix* (@ Sözen).

Birds (AVES)

270 bird species were detected during the site surveys and from the records. The species and their localities are given in **Table 3.** and several photographs of the bird species are presented in **Figure 3-12.**

Protection Status of the Bird Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the bird species detected at the project site and its vicinity;

Two Species are listed in EN (Endangered) category as *Oxyuraleucocephala*(White-headed Duck) and *Neophron percnopterus* (Egyptian Vulture).

Eight Species are listed in VU (Vulnerable) category as *Podiceps auritus* (Slavonian Grebe), *Puffinus yelkouan* (Yelkouan Shearwater), *Branta ruficollis* (Red-breasted Goose), *Aythya ferina* (Pochard), *Melanitta fusca* (Velvet Scoter), *Aquila clanga (*Greater Spotted Eagle), *Aquila heliaca (*Eastern Imperial Eagle) and *Streptopelia turtur* (Turtle Dove).

Five species is in NT (Near Threatened), and 257 species is in LC (Least Concern) category.

According to BERN Convention

As a consequence of evaluation of BERN lists, among the 270 bird species detected on site, 95 species are listed in Bern List Appendix-II (Strictly Protected Fauna Species), 97 bird species are listed in Bern List Appendix-III (Protected Fauna Species) and 78 species are not listed in any lists.

According to CITES Convention

Among the 271 bird species detected on site, 3 species are listed in CITES List Appendix-I, 23 bird species are listed in CITES List Appendix-II 4 bird species are listed in CITES List Appendix-III and all others are not listed CITES lists.

According to MAK

In accordance to the evaluation results based on the protection lists determined for 2022-2023 season by Central Game Commission (MAK), among the detected bird species, 24 species are listed in Appendix-I (List of game animals protected by MAK), 49 species is included in Appendix-II (List of game animals whose hunting is allowed for certain periods for 2022-2023 season).

According to Bird Directive

52 species of birds App I, 24 species of birds App II, 1 species of bird App I-B, 11 species of birds App II-A, 21 species of birds App II-B, 2 species of birds App III-A and 25 species of birds App III-B are listed.

Table 3. Bird (AVES) Species detected at the study area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
GAVIIFORMES								
Gaviidae								
Gavia arctica	Karagerdanlıdalgıç	Black-throated Diver	LC	APP II	-	-	-	
Gavia stellata	Kızılgerdanlıdalgıç	Red-throated Loon	LC	APP II	-	-	APP I	
PODICIPEDIFORMES								
Podicipedidae								
Podiceps cristatus	Bahri	Great Crested Grebe	LC	APP III	-	-	-	
Tachybaptus ruficollis	Küçükbatağan	Little Grebe	LC	APP II	-	-	-	
Podiceps auritus	Kulaklıbatağan	Slavonian Grebe	VU	APP II	-	-	APP I	
Podiceps nigricollis	Karaboyunlubatağan	Black-necked Grebe	LC	APP II	-	-	-	
PROCELLARIIFORMES								
Procellariidae								
Puffinus yelkouan	Yelkovan	Yelkouan Shearwater	VU	APP II	-	-	APP I	
PELECANIFORMES								
Phalacrocoracidae								
Phalacrocorax carbo	Karabatak	Cormorant	LC	APP III	-	APP II	-	
Phalacrocorax aristotelis	Tepelikarabatak	Shag	LC	APP II	-	-	-	
Phalacrocoracidae								
Pelecanus onocrotalus	Ak pelikan	White Pelican	LC	APP II	-	-	APP I	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
CICONIIFORMES								
Ardeidae								
Botaurus stellaris	Balaban	Bittern	LC	APP II	-	-	APP I	
Ixobrychus minutus	Küçükbalaban	Little Bittern	LC	APP II	-	-	APP I	
Nycticoraxnycticorax	Gecebalıkçılı	Night Heron	LC	APP II	-	-	APP I	
Ardeolaralloides	Alaca balıkçıl	Squacco Heron	LC	APP II	-	-	APP I	
Bubulcus ibis	Sığır balıkçıl	Cattle Egret	LC	APP II	-	-	-	
Egretta garzetta	Küçükakbalıkçıl	Little Egret	LC	APP II	-	-	-	
Ardea alba	Büyük akbalıkçıl	Great White Egret	LC	APP II	-	-	-	
Ardea cinerea	Gri balıkçıl	Grey Heron	LC	APP III	-	APP I	-	
Ardea purpurea	Erguvani balıkçıl	Purple Heron	LC	APP II		-	APP I	
Ciconiidae								
Ciconia nigra	Kara leylek	Black Stork	LC	APP II	APP II	-	APP I	
Ciconia ciconia	Leylek	White Stork	LC	APP II	-	-	APP I	
Thereskionithidae								
Plegadis falcinellus	Çeltikçi	Glossy İbis	LC	APP II	-	-	APP I	
Platalea leucorodia	Kaşıkçı	Spoonbill	LC	APP II	APP II	-	APP I	
Phoenicopteridae								
Phoenicopterus roseus	Flamingo	Greater Flamingo	LC	-	APP II	-	-	
ANSERIFORMES								
Anatidae								

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Cygnus olor	Kuğu	Mute Swan	LC		-	-	APP II-B	
Cygnus columbianus	Küçükkuğu	Bewick's Swan	LC	APP II	-	-	APP I	
Cygnus cygnus	Ötücükuğu	Whooper Swan	LC	APP II	-	-	APP I	
Anseralbifrons	Sakarca	White-fronted Goose	LC	-	-	APP II	APP I, APP II-B,APP III-B	
Anser anser	Boz kaz	Greylang Goose	LC	-	-	APP I	APP II-A,APP III-B	
Anser fabalis	Tarla kazı		LC	APP II	-	APP I	APP II-A	
Branta ruficollis	Sibiryakazı	Red-breasted Goose	VU	APP II	APP II	-	APP I	
Tadorna ferruginea	Angıt	Ruddy Shelduck	LC	APP II	-	-	APP I	
Tadorna tadorna	Suna	Shelduck	LC	APP II	-	-		
Anas penelope	Fiyu	Wigeon	LC	-	-	APP II	APP II-A,APP III-B	
Anas strepera	Boz ördek	Gadwall	LC	-	-	APP II	APP II-A	
Anas crecca	Çamurcun	Teal	LC	-	-	APP II	APP II-A,APP III-B	
Anas platyrhynchos	Yeşilbaş	Mallard	LC	-	-	APP II	APP II-A, APP III-A	
Anas acuta	Kılkuyruk	Pintail	LC	-	-	APP II	APP II-A,APP III-B	
Anas querquedula	Çıkrıkçın	Garganey	LC	-	-	APP II	APP II-A	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Anas clypeata	Kaşıkgaga	Shoveler	LC	APP III	-	APP II	-	
Netta rufina	Macar ördeği	Red-crested Pochard	LC		-	APP II	APP II-B	
Aythya ferina	Elmabaşpatka	Pochard	VU	-	-	APP II	APP II-A,APP III-B	
Aythya nyroca	Pasbaşpatka	Ferruginous Duck	NT	-	-	-	APP I	
Aythya fuligula	Tepelipatka	Tufted Duck	LC	APP III	-	APP II	-	
Aythya marila	Karabaş patka	Scaup	LC	-	-	-	APP II-B, APP III-B	
Somateria mollissima	Pufla	Common Eider	LC	-	-	-	APP II-B, APP III-B	
Melanitta nigra	Kara ördek	Common Scoter	LC	-	-	-	APP II-B, APP III-B	
Melanitta fusca	Kadife ördek	Velvet Scoter	VU	-	-	-	APP II-B, APP III-B	
Bucephala clangula	Altıngöz	Goldeneye	LC	-	-	-	APP II-B	
Mergus albellus	Sütlabi	Smew	LC	APP II	-	-	APP I	
Mergus serrator	Tarakdiş	Red-breasted Merganser	LC		-	APP I	APP II-B	
Oxyura leucocephala	Dikkuyruk	White-headed Duck	EN	APP II	APP II	-	APP I	
FALCONIFORMES								
Accipitridae								
Pernis apivorus	Arı şahini	Honey Buzzard	LC	APP II	APP II	-	APP I	
Milvus migrans	Kara çaylak	Black Kite	LC	APP II	APP II	-	APP I	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Haliaeetus albicilla	Akkuyruklukartal	White Tailed Eagle	LC	APP II	APP I	-	APP I	
Neophron percnopterus	Küçükakbaba	Egyptian Vulture	EN	APP II	APP II	-	APP I	
Circaetus gallicus	Yılankartalı	Short-toed Eagle	LC	APP II	APP II	-	APP I	
Circus aeruginosus	Sazdelicesi	Marsh Harrier	LC	APP II	APP II	-	-	
Circus cyaneus	Gökçe delice	Gökçe delice	LC	APP II	APP II	-	APP I	
Accipiter gentilis	Çakır	Goshawk	LC	APP II	APP II	-	APP I	
Accipiter nisus	Atmaca	Sparrowhawk	LC	APP II	APP II	-	APP I	
Buteo buteo	Şahin	Buzzard	LC	APP II	APP II	-	-	
Buteo rufinus	Kızılşahin	Long-legged Buzzard	LC	APP II	APP II	-	APP I	
Buteo lagopus	Paçalışahin	Rough-legged Buzzard	LC	APP II	APP II	-	-	
Aquila pomarina	Küçükormankartalı	Lesser Spotted Eagle	LC	APP II	APP II	-	-	
Aquila clanga	Büyük ormankartalı	Greater Spotted Eagle	VU	APP II	APP II	-	APP I	
Aquila heliaca	Şahkartal	Eastern Imperial Eagle	VU	APP II	APP I	-	APP I	
Aquila chrysaetos	Kaya kartalı	Golden Eagle	LC	APP II	APP II	-	APP I	
Hieraaetus pennatus	Küçükkartal	Booted Eagle	LC	APP II	APP II	-	APP I	
Pandionidae								
Pandion haliaetus	Balık kartalı	Osprey	LC	APP II	APP II	-	APP I	
Falconidae								
Falco naumanni	Küçükkerkenez	Lesser Kestrel	LC	APP II	APP II	-	APP I	
Falco tinnunculus	Kerkenez	Kestrel	LC	APP II	APP II	-		

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Falco vespertinus	Aladoğan	Red-footed Falcon	NT	APP II	APP II	-	APP I	
Falco columbarius	Bozdoğan	Merlin	LC	APP II	APP II	-	APP I	
Falco subbuteo	Delice doğan	Hobby	LC	APP II	APP II	-	-	
Falco peregrinus	Gökdoğan	Peregrine	LC	APP II	APP I	-	-	
GALLIFORMES								
Phasianidae								
Alectoris chukar	Kınalıkeklik	Chukar	LC	-	-	APP II	APP II-B	
Coturnix coturnix	Bıldırcın	Quail	LC	APP III	-	APP II	-	
Phasianus colchicus	Sülün	Pheasant	LC	-	-	APP I	APP II-A,APP III-A	
GRUIFORMES								
Rallidae								
Rallus aquaticus	Sukılavuzu	Water Rail	LC		-	APP I	APP II-B	
Porzana porzana	Beneklisuyelvesi	Spotted Crake	LC	APP II	-	-	APP I	
Porzana parva	Bataklıksuyelvesi	Little Crake	LC	APP II	-	-	APP I	
Crex crex	Bıldırcınkılavuzu	Corncrake	LC	APP II	-	-	APP I	
Gallinula chloropus	Sutavuğu	Moorhen	LC		-	APP I	APP II-B	
Porphyrio porphyrio	Sazhorozu	Purple Swamphen	LC	APP II	-	-	APP I	
Fulica atra	Sakarmeke	Coot	LC	APP III	-	APP II	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Gruidae								
Grus grus	Turna	Crane	LC	APP II	APP II		APP I	
CHARADIIFORMES								
Haematopodidae								
Haematopus ostralegus	Poyrazkuşu	Oystercatcher	LC	-	-	APP I	APP II-B	
Recurvirostridae								
Himantopus himantopus	Uzunbacak	Black-winged Stilt	LC	APP II	-	-	APP I	
Recurvirostra avosetta	Kılıçgaga	Avocet	LC	APP II	-	-	APP I	
Burhinidae								
Burhinuso edicnemus	Kocagöz	Stone Curlew	LC	APP II	-	-	APP I	
Glareolidae								
Glareola pratincola	Bataklıkkırlangıcı	Collared Pranticole	LC	APP II	-	-	APP I	
Charadriidae								
Charadrius dubius	Halkalıküçükyağmurkuşu	Little Ringed Plover	LC	APP II	-	-	-	
Charadrius hiaticula	Halkalıyağmurkuşu	Ringed Plover	LC	APP II	-	-	-	
Charadrius alexandrinus	Akça yağmurkuşu	Kentish Plover	LC	APP II	-	-	APP I	
Pluvialis apricaria	Altın yağmurcun	Golden Plover	LC	-	-	APP I	APP I, APP II-B,APP III-B	
Pluvialis squatarola	Gümüş yağmurcun	Grey Plover	LC	-	-	APP I	APP II-B	
Vanellus spinosus	Mahmuzlukızkuşu		LC	APP II	-		APP I	
Vanellus vanellus	Kızkuşu	Lapwing	LC		-	APP I	APP II-B	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Scolopacidae								
Calidris canutus	Büyük kumkuşu	Knot	LC	-	-	APP I	APP II-B	
Calidris alba	Ak kumkuşu	Sanderling	LC	-	-	-	APP II-B	
Calidris minuta	Küçükkumkuşu	Little Stint	LC	-	-	-	APP II-B	
Calidris temminckii	Sarıbacaklıkumkuşu	Temminck's Stint	LC	-	-	-	APP II-B	
Calidris ferruginea	Kızılkumkuşu	Curlew Sandpiper	LC	APP II	-	-		
Calidris alpina	Karakarınlıkumkuşu	Dunlin	LC	APP II	-	-	APP I	
Limicola falcinellus	Sürmelikumkuşu	Broad-billed Sandpiper	LC	APP II	-	-	-	
Philomachus pugnax	Döğüşkenkuş	Ruff	LC	-	-	APP I	-	
Lymnocryptes minimus	Küçüksuçulluğu	Jack Snipe	LC	-	-	APP I	-	
Gallinago gallinago	Suçulluğu	Snipe	LC	-	-	-	-	
Gallinago media	Büyük suçulluğu	Great Snipe	NT	APP II	-	-	-	
Scolopax rusticola	Çulluk	Woodcock	LC	-	-	-	-	
Limosa limosa	Çamurçulluğu	Black-tailed Godwit	NT	-	-	APP I	-	
Limosa lapponica	Kıyıçamurçulluğu	Bar-tailed Godwit	LC	-	-	-	-	
Numenius phaeopus	Sürmelikervançulluğu	Whimbrel	LC	-	-	APP I	-	
Numenius arquata	Kervançulluğu	Curlew	NT	-	-	APP I	-	
Tringa erythropus	Kara kızılbacak	Spotted Redshank	LC	-	-	APP I	-	
Tringa totanus	Kızılbacak	Redshank	LC	-	-	APP I	-	
Tringa stagnatilis	Bataklıkdüdükçünü	Marsh Sandpiper	LC	APP II	-	-	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Tringa nebularia	Yeşilbacak	Greenshank	LC	-	-	APP I	-	
Tringa ochropus	Yeşil düdükçün	Green Sandpiper	LC	APP II	-	-	-	
Tringa glareola	Orman düdükçünü	Wood Sandpiper	LC	APP II	-	-	-	
Xenus cinereus	Terek düdükçünü	Terek Sandpiper	LC		-	APP I	-	
Actitis hypoleucos	Dere düdükçünü	Common Sandpiper	LC	APP II	-	-	-	
Arenaria interpres	Taşçeviren	Turnstone	LC	APP II	-	-	-	
Stercorariidae								
Stercorarius parasiticus	Korsanmartı	Arctic Skua	LC	-	-	APP I	-	
Laridae								
Ichthyaetus ichthyaetus	Büyük karabaşmartı	Great Black-headed Gull	LC		-	APP I	-	
Ichthyaetus melanocephalus	Akdeniz martısı	Mediterranean Gull	LC	APP III	-	-	APP II	
Hydrocoloeus minutus	Küçükmartı	Little Gull	LC	APP III	-	-	APP II	
Chroicocephalus ridibundus	Karabaş martı	Black-headed Gull	LC	-	-	APP I	APP III-B	
Larus canus	Küçükgümüşmartı	Common Gull	LC	-	-	APP I	APP III-B	
Larus michahellis	Gümüş martı	Yellow-legged Gull	LC	APP III	-	APP I	-	
Larus fuscus	Karasırtlımartı	Lesser Black-backed Gull	LC	-	-	APP I	APP III-B	
Rissa tridactyla	Karaayaklımartı	Kittiwake	LC	-	-	APP I		
Gelochelidon nilotica	Gülen sumru	Gull-billed Tern	LC	APP III	-	-	APP II	
Thalasseus sandvicensis	Karagagalısumru	Sandwich Tern	LC	APP III	-	-	APP II	
Sterna hirundo	Sumru	Common Tern	LC	APP III	-	-	APP II	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Chlidonias hybrida	Bıyıklısumru	Whiskered Tern	LC	APP III	-	-	APP II	
Chlidonias niger	Kara sumru	Black Tern	LC	APP III	-	-	APP II	
Chlidonias leucopterus	Akkanatlısumru	White-winged Black Tern	LC	APP III	-	-		
COLUMBIFORMES								
Columbidae								
Columba livia	Kaya güvercini	Rock Dove	LC	APP III	-	APP II	-	
Columba oenas	Gökçe güvercin	Stock Dove	LC	-	-	APP I	APP III-B	
Columba palumbus	Tahtalı	Woodpigeon	LC	-	-	APP I	-	
Streptopelia decaocto	Kumru	Collared Dove	LC	-	-	APP II	APP III-B	
Streptopelia turtur	Üveyik	Turtle Dove	VU	-	-	APP I	APP III-B	
Spilopelia senegalensis	Küçükkumru	Laughing Dove	LC	-	-	APP I	-	
Oena capensis	Kap kumrusu	Namaqua Dove	LC	-	-	-	-	
CUCULIFORMES								
Cuculidae								
Cuculus canorus	Guguk	Cuckoo	LC	-	-	-	-	
STRIGIFORMES								
Tytonidae								
Tyto alba	Peçelibaykuş	Barn Owl	LC	APP III	APP III			
Strigidae								

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Athene noctua	Kukumav	Little Owl	LC	APP III	APP III	-		
Strixaluco	Alaca baykuş	Tawny Owl	LC	APP III	APP III	-		
Asiootus	Kulaklıormanbaykuşu	Long-eared Owl	LC	APP III	APP III	-		
CAPRIMULGIFORMES								
Caprimulgidae								
Caprimulgus europaeus	Çobanaldatan	Nightjar	LC	APP III			APP II	
APODIFORMES								
Apodidae								
Apus apus	Ebabil	Swift	LC		-	-		
Tachymarptis melba	Akkarınlısağan	Alpine Swift	LC	APP III	-	-		
CORACIIFORMES								
Alcedinidae								
Alcedo atthis	Yalıçapkını	Kingfisher	LC	APP II	-		-	
Meropidae								
Merops apiaster	Arıkuşu	Bee-eater	LC	APP III	-	-		
Coraciidae								
Coracias garrulus	Gökkuzgun	Roller	LC	APP III	-	-	APP II	
BUCEROTIFORMES								
Upupidae								
Upupa epops	İbibik	Hoopoe	LC	APP III	-	-		
PICIFORMES								

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Picidae								
Jynx torquilla	Boyunçeviren	Wryneck	LC	APP III	-	-		
Picus canus	Küçükyeşilağaçkakan	Grey-headed Woodpecker	LC	APP II	-	-	-	
Picus viridis	Yeşil ağaçkakan	Green Woodpecker	LC	APP II	-	-	-	
Dryocopus martius	Kara ağaçkakan	Black Woodpecker	LC	APP III	-	-	APP II	
Dendrocopos major	Orman alacaağaçkakanı	Great-Spotted Woodpecker	LC	APP III	-	-	APP II	
Dendrocopos syriacus	Alaca ağaçkakan	Syrian Woodpecker	LC	APP II	-	-	-	
Dendrocopos medius	Ortancaağaçkakan	Middle Spotted Woodpecker	LC	APP III	-	-	APP II	
Dendrocopos leucotos	Aksırtlıağaçkakan	White-backed Woodpecker	LC	APP III	-	-	APP II	
Dendrocopos minor	Küçükağaçkakan	Lesser Spotted Woodpecker	LC	APP III	-	-		
PASSERIFORMES								
Alaudidae								
Ammomanes deserti	Çöltoygarı	Desert Lark	LC	-	-	APP I		
Melanocorypha calandra	Boğmaklıtoygar	Calandra Lark	LC	APP III	-	-	APP II	
Galerida cristata	Tepelitoygar	Crested Lark	LC	-	-	APP I		
Lullula arborea	Orman toygarı	Woodlark	LC	APP III	-	APP I	-	
Alauda arvensis	Tarlakuşu	Skylark	LC	-	-	APP I	APP III-B	
Hirundinidae								
Riparia riparia	Kum kırlangıcı	Sand Martin	LC	APP III	-	-		
Hirundo rustica	Kır kırlangıcı	Swallow	LC	APP III	-	-		

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Cecropis daurica	Kızılkırlangıç	Red-rumped Swallow	LC	APP III	-	-		
Delicho nurbicum	Ev kırlangıcı	House Martin	LC	APP III	-	-		
Motacillidae								
Anthus campestris	Kır incirkuşu	Tawny Pipit	LC	APP III	-	-	APP II	
Anthus trivialis	Ağaçincirkuşu	Tree Pipit	LC	APP III	-	-		
Anthus pratensis	Çayırincirkuşu	Meadow Pipit	LC	APP III	-	-		
Anthus cervinus	Kızılgerdanlıincirkuşu	Red-thorated Pipit	LC	APP III	-	-		
Anthus spinoletta	Dağ incirkuşu	Water Pipit	LC	APP III	-	-		
Motacilla flava	Sarıkuyruksallayan	Yellow Wagtail	LC	APP III	-	-		
Motacilla citreola	Sarıbaşlıkuyruksallayan	Citrine Wagtail	LC	APP III	-	-		
Motacilla cinerea	Dağ kuyruksallayanı	Grey Wagtail	LC	APP II	-	-	-	
Motacilla alba	Ak kuyruksallayan	Pied Wagtail	LC	APP II	-	-	-	
Troglodytidae								
Troglodytestro glodytes	Çitkuşu	Wren	LC	APP III	-	-	APP II	
Prunellidae								
Prunella modularis	Dağbülbülü	Dunnock	LC	APP III	-	-		
Muscicapidae								
Erithacus rubecula	Kızılgerdan	Robin	LC	APP II	-	-	-	
Luscinia luscinia	Beneklibülbül	Thrush Nightingale	LC	APP III	-	-	-	
Luscinia megarhynchos	Bülbül	Nightingale	LC	APP III	-	-	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Luscinia svecica	Mavigerdan	Bluethroat	LC	APP III	-	-	APP II	
Phoenicurus ochruros	Kara kızılkuyruk	Black Redstart	LC	APP II	-	-	-	
Phoenicurus phoenicurus	Kızılkuyruk	Redstart	LC	APP II	-	-	-	
Saxicola rubetra	Çayırtaşkuşu	Whinchat	LC	APP III	-	-	-	
Saxicola torquata	Taşkuşu	Stonechat	LC	APP II	-	-	-	
Saxicola maurus	Sibiryataşkuşu	Siberian Stonechat	LC	-	-	-	-	
Oenanthe isabellina	Boz kuyrukkakan	Isabellina Wheatear	LC	APP III	-	APP I	-	
Oenanthe oenanthe	Kuyrukkakan	Northern Wheatear	LC	APP III	-	APP I	-	
Oenanthe hispanica	Karakulaklıkuyrukkakan	Black-eared Wheatear	LC	APP III	-	-	-	
Muscicapa striata	Beneklisinekkapan	Spotted Flycatcher	LC	APP III	-	-	-	
Ficedula parva	Küçüksinekkapan	Red-breasted Flycatcher	LC	APP III	-	-	APP II	
Turdidae								
Turdus torquatus	Boğmaklıardıç	Ring Ouzel	LC	APP III	-	-	-	
Turdus merula	Karatavuk	Blackbird	LC	APP III	-	APP II	-	
Turdus pilaris	Tarla ardıcı	Fieldfare	LC	-	-	APP I	APP III-B	
Turdus philomelos	Öterardıç	Song Thrush	LC	-	-	APP II	APP III-B	
Turdus iliacus	Kızılardıç	Redwing	LC	-	-	APP I	APP III-B	
Turdus viscivorus	Ökseardıcı	Mistle Thursh	LC	-	-	APP I	APP III-B	
Cettiidae								

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Cettiacetti	Kamışbülbülü	Cetti's Warbler	LC	APP III	-	-		
Locustellidae								
Locustella luscinioides	Bataklıkkamışçını	Savi's Warbler	LC	APP III	-	-		
Acrocephalidae								
Acrocephalus schoenobaenus	Kındırakamışçını	Sedge Warbler	LC	APP III	-	-		
Acrocephalus scirpaceus	Sazkamışçını	Reed Warbler	LC	APP III	-	-		
Acrocephalus arundinaceus	Büyük kamışçın	Great Reed Warbler	LC	APP III	-	-		
Iduna pallida	Ak mukallit	Olivaceous Warbler	LC	APP III	-	-		
Hippola isicterina	Sarımukallit	Icterine Warbler	LC	APP III	-	-		
Sylvidae								
Sylvia melanocephala	Maskeliötleğen	Sardinian Warbler	LC	APP II	-	-	-	
Sylvia curruca	Küçükakgerdanlıötleğen	Lesser Whitethroat	LC	APP III		-		
Sylvia communis	Akgerdanlıötleğen	Whitethroat	LC	APP II	-	-	-	
Sylvia borin	Boz ötleğen	Garden Warbler	LC	APP III		-		
Sylvia atricapilla	Karabaşlıötleğen	Blackcap	LC	APP II	-	-	-	
Sylvia nisoria	Çizgiliötleğen	Barred Warbler	LC	APP III		-	APP II	
Phylloscopidae								
Phylloscopus nitidus	Yeşil çıvgın	Green Warbler	LC	APP III	-	-		
Phylloscopus collybita	Çıvgın	Chiffchaff	LC	APP II	-	-	-	
Phylloscopus trochilus	Söğütbülbülü	Willow Warbler	LC	APP II	-	-	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Phylloscopus sibilatrix	Orman çıvgını	Wood Warbler	LC	APP III		-	-	
Regulidae								
Regulus regulus	Çalıkuşu	Goldcrest	LC	APP III	-	-	-	
Regulus ignicapilla	Sürmeliçalıkuşu	Firecrest	LC	APP III	-	-	-	
Panuridae								
Panurus biarmicus	Bıyıklıbaştankara	Bearded Tit	LC	APP III	-	-		
Aegithalidae								
Aegithalos caudatus	Uzunkuyruklubaştankara	Long-tailed Tit	LC	-	-	-		
Paridae								
Poecile palustris	Kayınbaştankarası	Marsh Tit	LC	APP III	-	-	-	
Poecile lugubris	Akyanaklıbaştankara	Sombre Tit	LC	APP III	-	-	-	
Periparus ater	Çam baştankarası	Coal Tit	LC	APP II	-	-	APP II	
Parus major	Büyük baştankara	Great Tit	LC	APP II	-	-	-	
Cyanistes caeruleus	Mavi baştankara	Blue Tit	LC	APP II	-	-	-	
Certhiidae								
Certhia familiaris	Orman tırmaşıkkuşu	Treecreeper	LC	APP III	-	-		
Certhia brachydactyla	Bahçetırmaşıkkuşu	Short-toed Treecreeper	LC	APP III	-	-	APP II	
Oriolidae								
Oriolusoriolus	Sarıasma		LC	APP III	-	-	-	
Laniidae								
Lanius collurio	Kızılsırtlıörümcekkuşu	Red-backed Shrike	LC	APP II	-	APP I	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Lanius minor	Karaalınlıörümcekkuşu	Lesser Grey Shrike	LC	APP III	-	-	APP II	
Lanius senator	Kızılbaşlıörümcekkuşu	Woodchat Shrike	LC	APP III	-	-		
Lanius nubicus	Maskeliörümcekkuşu	Masked Shrike	LC	APP III	-	-	APP II	
Corvidae								
Garrulus glandarius	Alakarga	Jay	LC	-	-	APP II	-	
Pica pica	Saksağan	Magpie	LC	-	-	APP II	APP III-B	
Coloeus monedula	Küçükkarga	Jackdaw	LC	-	-	APP II	APP III-B	
Corvus frugilegus	Ekin kargası	Rook	LC	-	-	APP II	-	
Corvus corone	Leşkargası	Hooded Crow	LC	-	-	APP II	-	
Corvus corax	Kuzgun	Raven	LC	APP III	-	APP I	-	
Sturnidae								
Sturnus vulgaris	Sığırcık	Starling	LC	-	-	APP I	APP III-B	
Pastor roseus	Ala sığırcık	Rose-coloured Starling	LC	APP III	-			
Passeridae								
Passer domesticus	Serçe	House Sparrow	LC	-	-	APP II	-	
Passer hispaniolensis	Söğüt serçesi	Spanish Sparrow	LC	-	-	APP I	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Passer montanus	Ağaçserçesi	Tree Sparrow	LC	-	-	APP I	-	
Fringillidae								
Fringilla coelebs	İspinoz	Chaffinch	LC	APP III	-	APP I	-	
Fringilla montifringilla	Dağ ispinozu	Brambling	LC		-	APP I	-	
Serinus serinus	Küçükiskete	Serin	LC	APP III	-	-	-	
Chloris chloris	Florya	Greenfinch	LC	APP III	-	-	-	
Carduelis carduelis	Saka	Goldfinch	LC	APP II	-	-	-	
Spinus spinus	Karabaşlıiskete	Siskin	LC	APP III	-	-	-	
Linaria cannabina	Ketenkuşu	Linnet	LC	APP III	-	-	-	
Loxia curvirostra	Çaprazgaga	Red Crossbill	LC	APP III	-	-	-	
Carpodacus erythrinus	Çütre	Common Rosefinch	LC	APP III	-	-	-	
Coccothraustes coccothraustes	Kocabaş	Hawfinch	LC	APP III	-	-	-	
Emberizidae								
Emberiza citrinella	Sarıçinte	Yellowhammer	LC	APP II	-	-	-	
Emberiza cirlus	Bahçeçintesi	Cirl Bunting	LC	APP III	-	-	-	
Emberiza cia	Kaya çintesi	Rock Bunting	LC	APP III	-	-	-	
Emberiza hortulana	Kirazkuşu	Ortolan	LC	APP III	-	APP I	-	
Emberiza caesia	Kızılkirazkuşu	Cretzschmar`s Bunting	LC	APP III	-	-	APP II	
Emberiza schoeniclus	Bataklıkçintesi	Reed Bunting	LC	APP III	-	-	-	
Emberiza melanocephala	Karabaşlıçinte	Black-headed Bunting	LC	APP III	-	-	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Bird Directive	Endemic
Emberiza calandra	Tarla çintesi	Corn Bunting	LC	-	-	APP I	-	



Figure 3. Photographs of some bird species determined in study area. a. *Falco vespertinus*, b. *Pandion haliaetus*, c. *Accipiter nisus*, d. *Haliaeetus albicilla*, e. *Aquila clanga*, f. *Pernis apivorus*, g. *Circus cyaneus*, h. *Falco peregrinus*. (@ Sözen).

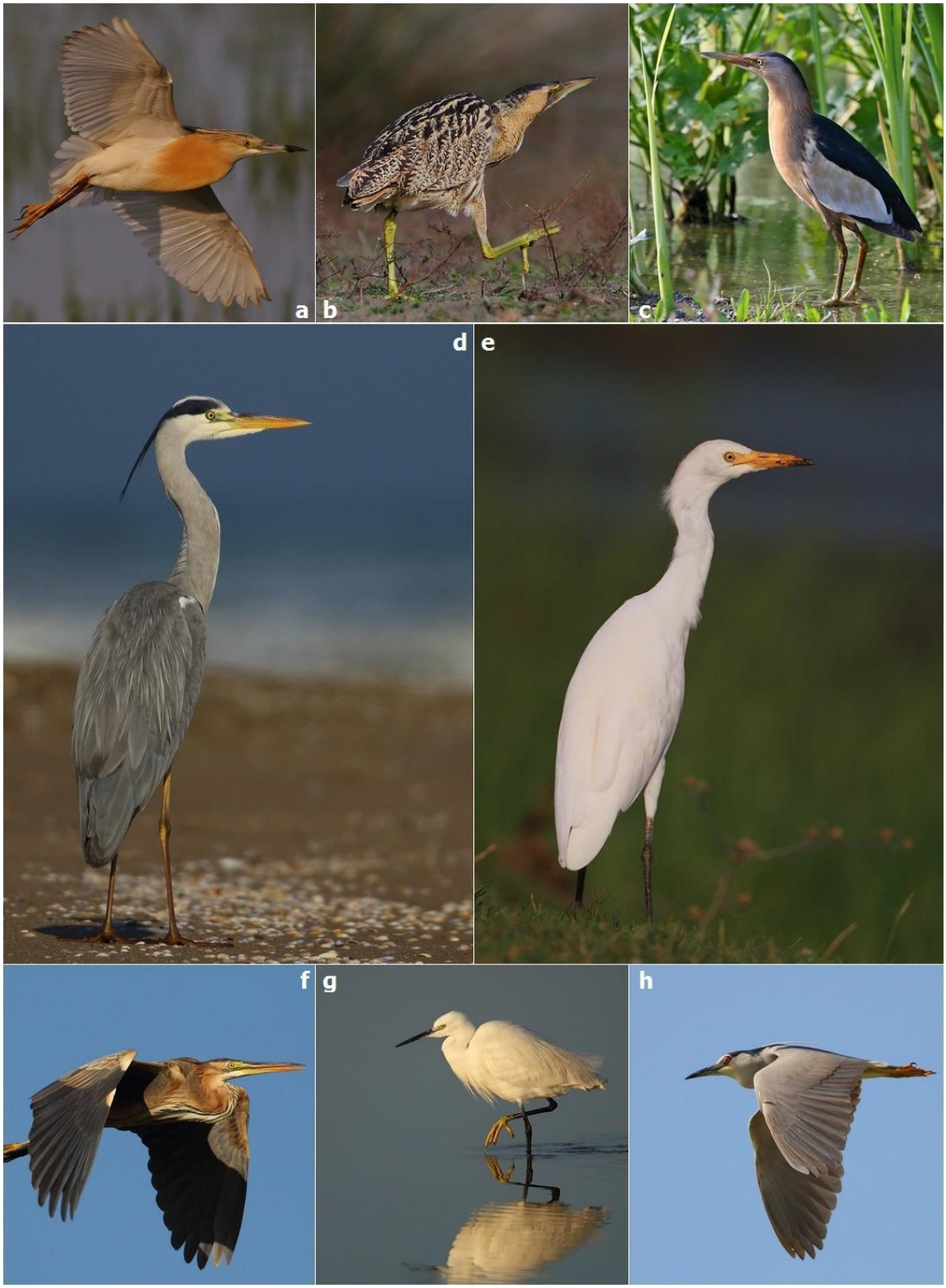


Figure 4. Photographs of some bird species determined in study area. a. *Ardeolaralloides*, b.*Botaurus stellaris*, c. *Ixobrychus minutus* , d. *Ardea cinerea*, e. *Bubulcus ibis*, f. *Ardea purpurea*, g. *Egretta garzetta*, h. *Nycticorax nycticorax*.(@ Sözen).

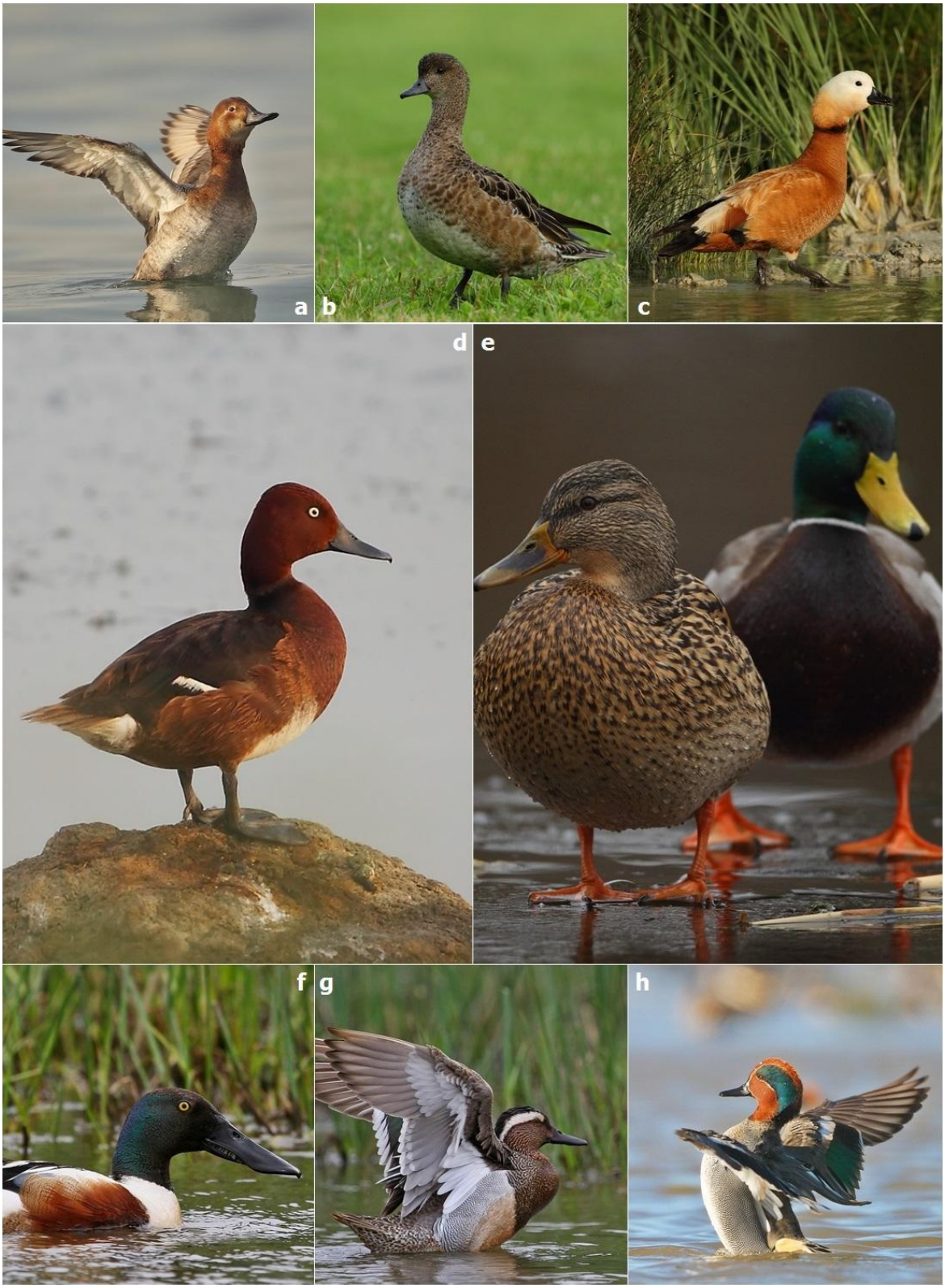


Figure 5. Photographs of some bird species determined in study area. a. *Aythya ferina*, b.*Anas penelope*, c. *Tadorna ferruginea* , d. *Aythya nyroca*, e. *Anas platyrhynchos*, f. *Anas clypeata*, g. *Anas querquedula*, h. *Anas crecca*.(@ Sözen).

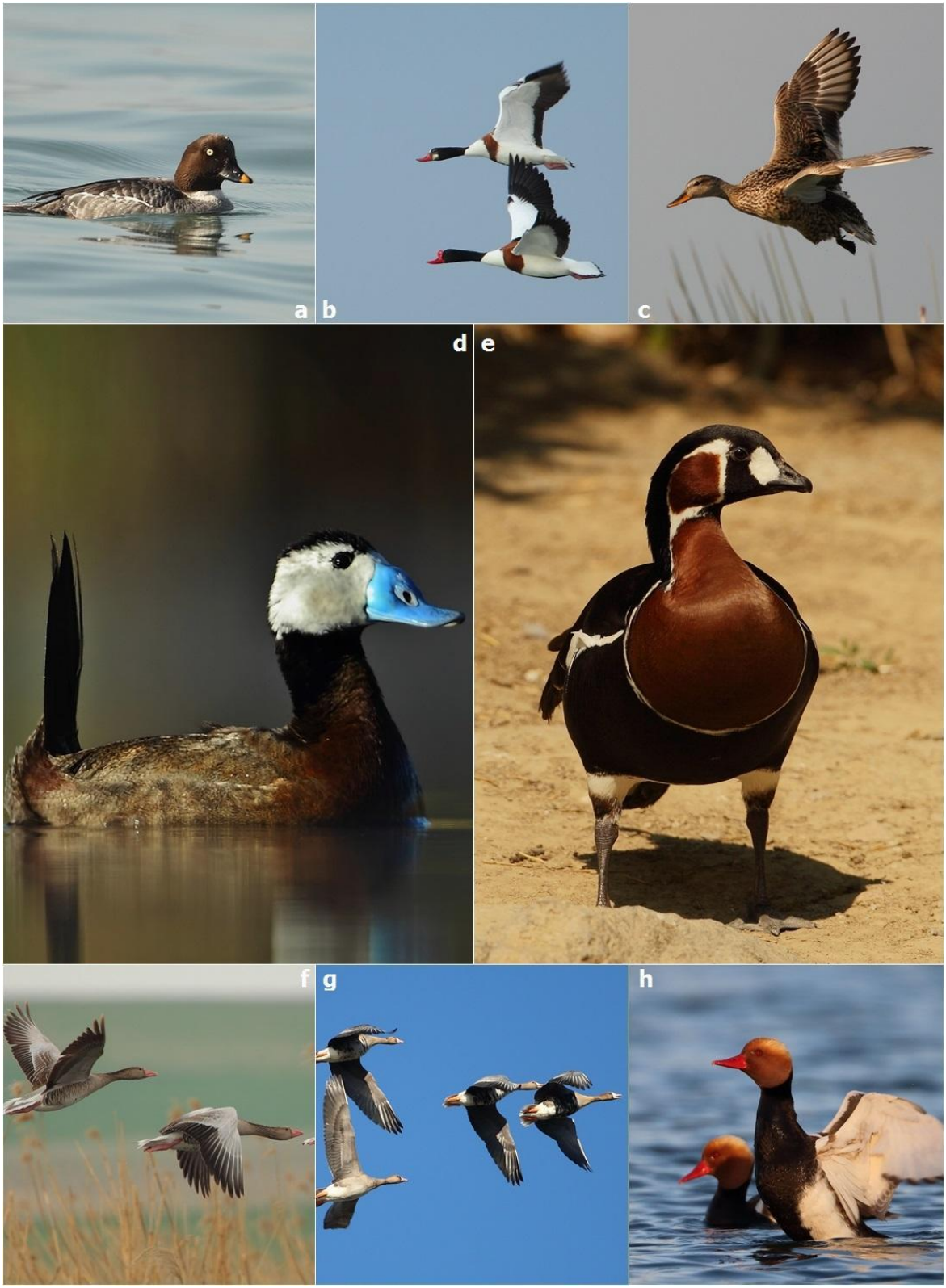


Figure 6. Photographs of some bird species determined in study area. a. *Bucephala clangula*, b.*Tadorna tadorna*, c. *Anas strepera* , d. *Oxyura leucocephala*, e. *Branta ruficollis*, f. *Anser anser*, g. *Anser albifrons*, h. *Netta rufina*.(@ Sözen).

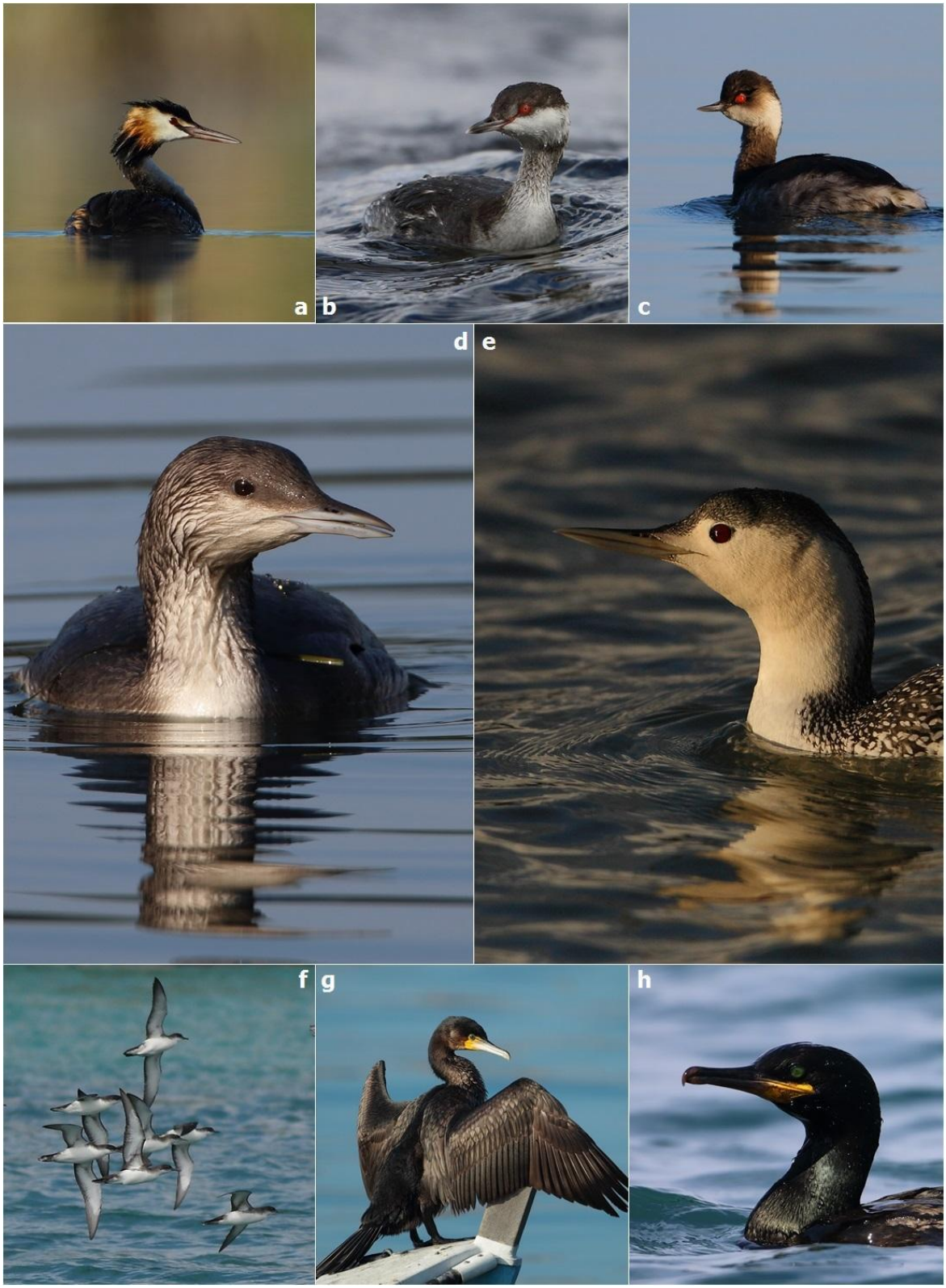


Figure 7. Photographs of some bird species determined in study area. a. *Podiceps cristatus*, b.*Podiceps auritus*, c. *Podiceps nigricollis* , d. *Gavia arctica*, e. *Gavia stellata*, f. *Puffinus yelkouan*, g. *Phalacrocorax carbo*, h. *Phalacrocorax aristotelis*.(@ Sözen).



Figure 8. Photographs of some bird species determined in study area. a. *Gallinagogallinago*, b.*Calidris canutus*, c. *Calidris alba*, d. *Calidris minuta*, e. *Numenius phaeopus*, f. *Limicola falcinellus*, g. *Calidris alpina*, h. *Calidris ferruginea*.(@ Sözen).



Figure 9. Photographs of some bird species determined in study area. a. *Sterna sandvicensis*, b. *Larus fuscus*, c. *Larus ichthyaetus*, d. *Larus ridibundus*, e. *Larus melanocephalus*, f. *Sterna hirundo*, g. *Larus michahellis*, h. *Gelochelidon nilotic*a.(@ Sözen).



Figure 10. Photographs of some bird species determined in study area. a. *Dendrocopos minor*, b. *Dendrocopos syriacus*, c. *Picus canus*, d. *Picus viridis*, e. *Jynx torquilla*, f. *Dendrocopos major*, g. *Dendrocopos leucotos*, h. *Dendrocopos medius*.(@ Sözen).



Figure 11. Photographs of some bird species determined in study area. a. *Panurusbiarmicus*, b. *Fringilla montifringill*a, c. *Coccothraustes coccothraustes*, d. *Luscinia megarhynchos*, e. *Acrocephalus arundinaceu*s, f. *Delicho nurbica*, g. *Hirundo daurica*, h. *Hirundo rustica*.

(@ Sözen).

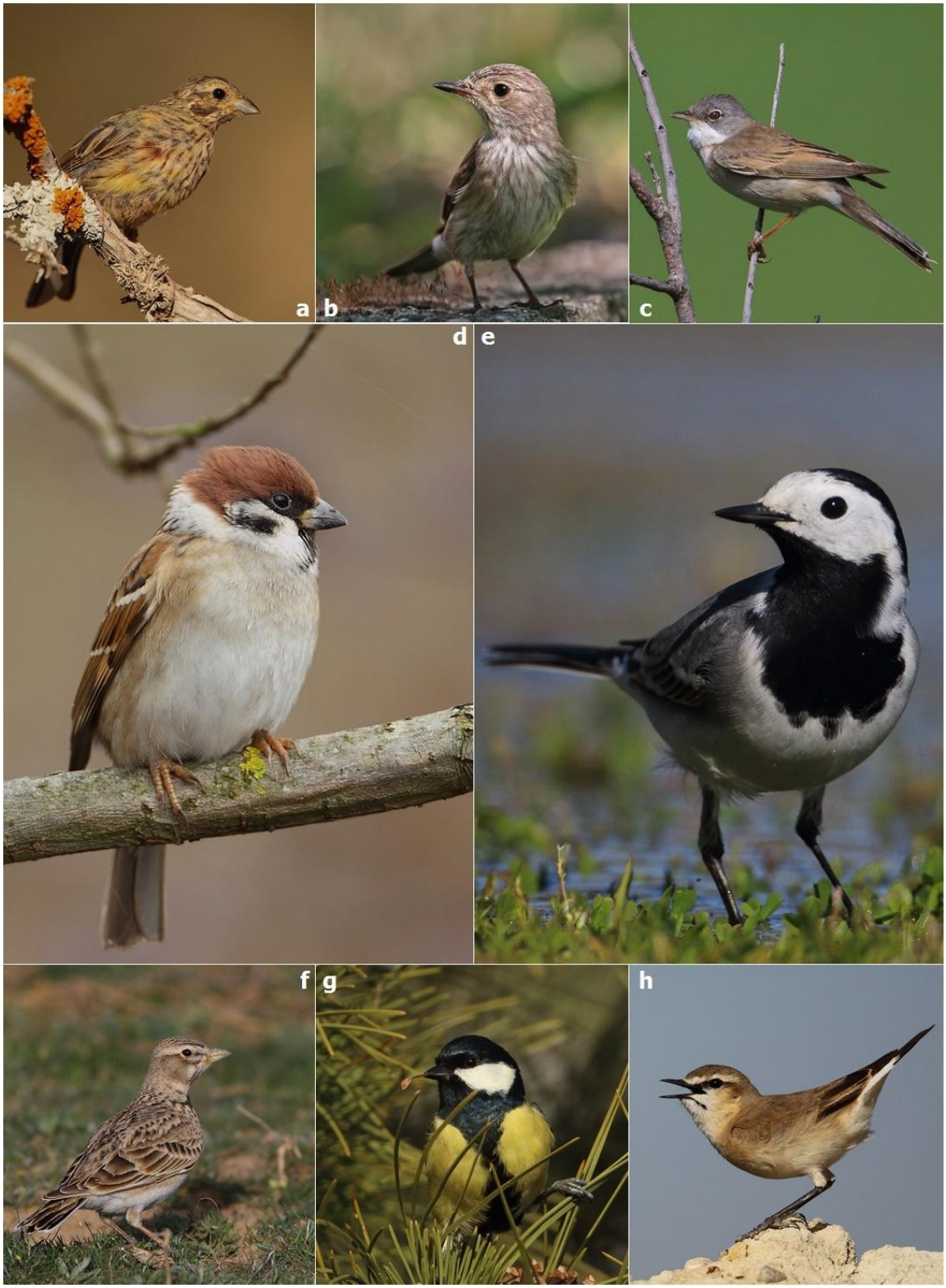


Figure 12. Photographs of some bird species determined in study area. a. *Emberizacia,* b.*Muscicapa striata*, c. *Sylvia communis,* d. *Passer montanus*, e. *Motacilla alba,* f. *Melanocorypha calandra*, g. *Parus major*, h. *Oenanthe isabellin*a.(@ Sözen).

Mammals (MAMMALIA)

A total of 40 mammalian species were detected accordinng to the site surveys and literatüre data. Among them, one belongs to hedgehog (ERINACEIMORPHA) order, three of them belong to the SORICOMORPHA, 13 of them belong to bats (CHIROPTERA) order, one belong to rabbits (LAGOMORPHA), 11 belong to rodents (RODENTIA), nine of them belongs to carnivore (CARNIVORA) and two of them are even-toed (ARTIODACTYLA) order and the information on them are given in **Table 4.** and related photographs are given in **Figure 12** and **13** One of the mammal species listed *Talpa levantis* (Levantine mole) is an endemic malmmal Species to Türkiye.

Protection Status of the Mammalian Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the mammalian species detected at the project site and its vicinity, only Brown Bear(Ursus arctos) and Long-fingered Bat (Myotis capaccinii) are listed in Vulnerable (VU) category. Among 40 mammalian species, two species are in VU (Vulnerable), 3 species is in NT (Near Threatened), 35 species is in LC (Least Concern).

According to BERN Convention

As a consequence of evaluation of BERN lists, among the 40 mammalian species detected on site, 15 species are listed in Bern List Appendix-II (Strictly Protected Fauna Species), 10 mammalian species are listed in Bern List Appendix-III (Protected Fauna Species) and 15 species are not listed in any lists.

According to CITES Convention

One mammalian species is listed App I and 1 species listed App II.

According to MAK

In accordance to the evaluation results based on the protection lists determined for 2022-2023 season by Central Game Commission (MAK), among the detected mammalian species, 2 species are listed in Appendix-I, 3 species is included in Appendix-II.

According to European Habitat Directive (Natura 2000 Annexes)

10 mammalian species is in Annex-II, 5 mammalian species is included in Annex-IV and 1 mammalian species listed in Ann V.



Figure 13. Photographs of some Mammalian Species determined in study area. a. *Erinaceus concolor*, b. *Talpa levantis*, c. *Crocidura leucodon*, d. *Rhinolophus hipposideros*, e. *Mustela nivalis*, f. *Rhinolophus ferrumequinum*, g. *Lepus europaeus*, h. *Sciurus anomalus*. (@ Sözen).

Table 4. Mammalian (MAMMALIA) Species Detected at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Habitat Directive	Endemic
ERINACEOMORPHA								
Erinaceidae								
Erinaceus concolor	Kirpi	*Southern White-breasted hedgehog*	LC	-	-	-	-	
SORICOMORPHA								
Talpidae								
Talpa levantis	Karadeniz Köstebeği	*Levantine Mole*	LC	-	-	-	-	Yes
Soricidae								
Crocidura leucodon	BeyazdişliSivrifare	*Bicolored Shrew*	LC	-	-	-	-	
Crocidura suaveolens	BahçeSivrifaresi	*Lesser White-toothed Shrew*	LC	-	-	-	-	
CHIROPTERA								
Rhinolophidae								
Rhinolophus hipposideros	KüçükNalburunluYarasa	Lesser Horseshoe Bat	LC	APP II	-	-	Ann II	
Rhinolophus ferrumequinum	Büyük NalburunluYarasa	Greater Horseshoe Bat	LC	APP II	-	-	Ann II	
Rhinolophus euryale	Akdeniz NalburunluYarasası	Mediterranean Horseshoe Bat	NT	APP II	-	-	Ann II	
Rhinolophus blasii	Blasius NalburunluYarasası	Blasius s Horseshoe Bat	LC	APP II	-	-	Ann II	
Vespertilionidae								
Pipistrellus pipistrellus	CüceYarasa	Common Pipistrelle	LC	APP III	-	-	-	
Myotis myotis	Farekulaklı Büyük Yarasa	Greater Mouse-eared Bat	LC	APP III	-	-	Ann II	
Myotis capaccinii	Uzunayaklı Yarasa	Long-fingered Bat	VU	APP II	-	-	Ann II	
Myotis mystacinus	Bıyıklı Siyah Yarasa	Whiskered Bat	LC	APP II	-	-	-	
Myotis emarginatus	KirpikliYarasa	Geoffroy s Bat	LC	APP II	-	-	Ann II	
Eptesicus serotinus	Akdeniz GenişkanatlıYarasası	Serotine Bat	LC	APP II	-	-	-	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Habitat Directive	Endemic
Pipistrellus pipistrellus	CüceYarasa	Common Pipistrelle	LC	APP II	-	-	-	
Nyctalus leisleri	KüçükAğaçYarasası	Lesser Noctule	LC	APP II	-	-	-	
Miniopteridae								
Miniopterus schreibersii	UzunkanatlıYarasa	Common Bent-Wing Bat	NT	APP II	-	-	Ann II	
LAGOMORPHA								
Leporidae								
Lepus europaeus	Yabani Tavşan	*European Hare*	LC	APP III	-	APP II	-	
RODENTIA								
Sciuridae								
Sciurus anomalus	Sincap	Caucasian Squirrel	LC	APP II	-	-	Ann IV	
Muridae								
Myodes glareolus	KızılOrmanfaresi	Bank Vole	LC	-	-	-	-	
Microtus levis	Tarlafaresi	Sbling Vole	LC	-	-	-	-	
Apodemus uralensis	KüçükOrmanfaresi	Ural Field Mouse	LC	-	-	-	-	
Apodemus flavicollis	SarıgöğüslüOrmanfaresi	Yellow-necked Mouse	LC	-	-	-	-	
Rattus rattus	Ev sıçanı	Black Rat	LC	-	-	-	-	
Rattus norvegîcus	Göçmen sıçan	Brown Rat	LC			-	-	
Mus macedonicus	SarıEvfaresi	Macedonian Mouse	LC	-	-	-	-	
Mus musculus	Ev faresi	House Mouse	LC	-		-	-	
Muridae								-
Glis glis	Yediuyur	Edible Dormouse	LC	App III	-	-	-	
Dryomys nitedula	Hasancık	Forest Dormouse	LC	App III	-	-	Ann IV	
CARNIVORA								
Canidae								
Canis aureus	Çakal	Golden Jackal	LC	-	-	APP II	Ann V	

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Habitat Directive	Endemic
Canis lupus	Kurt	Grey Wolf	LC	APP II	-	-	Ann IV	
Vulpes vulpes	Kızıltilki	Red Fox	LC	-	-	APP II	-	
Mustelidae								
Mustela nivalis	Gelincik	Least Weasel	LC	APP III	-	APP I	-	
Martes foina	Kaya sansarı	Beech Marten	LC	APP III		APP I	-	
Lutra lutra	Su samuru	Eurasian Otter	NT	APP II	App I	-	Ann II, Ann IV	
Meles meles	Porsuk	European Badger	LC	App III	-	APP I	-	
Ursidae								
Ursus arctos	Bozayı	Brown Bear	VU	APP II	APP II	-	Ann II, Ann IV	
Felidae								
Felis silvestris	Yabani kedi	Wild cat	LC	APP III	-	-	Ann IV	
ARTIODACTYLA								
Suidae								
Sus scrofa	Yabandomuzu	Wild Pig	LC	-	-	APP II	-	
Cervidae								
Capreolus capreolus	Karaca	Roe Deer	LC	APP III	-	-	-	

According to the EUNIS habitat assessment, 332 vertebrate species were identified living in the monitoring area where there are 9 different habitat types. Of these, 7 are amphibians, 15 are reptiles, 270 are birds and 40 are mammals. The Project area has a variety of ecosystems such as lakes, seaside, sandy beaches, flooded forests, woodlands, maquis areas, agricultural areas, settlements and forest clearings. This ecosystem diversity also increases the number of fauna species in the region. Of the vertebrate species in the region, 3 are endemic and 13 are threatened according to IUCN lists. When the identified vertebrate biodiversity is evaluated in relation to the size of the area, it can be said that the ecosystem services of the study area have the habitat diversity and energy flow level where the identified vertebrate species can realize their niches. In order to sustain and improve the biodiversity of the region, the most important practice is to carry out afforestation activities in accordance with the natural vegetation of the region and to protect the natural maquis and natural forest structure in the region.

ECOSYSTEM SERVICES

Ecosystem services are the conditions and processes through which natural ecosystems and the species that make them up, sustain and fulfil human life (Daily, 1997). The concept of ecosystem services encompasses the delivery, provision, production, protection or maintenance of a set of goods and services that people perceive to be important (**Table 5**). This includes goods such as seafood, forage, timber, biomass fuels, natural fibre, pharmaceuticals and industrial products, services such as the maintenance of biodiversity and life-support functions including waste assimilation, cleansing, recycling and renewal (Daily, 1997; Norberg, 1999), and intangible aesthetic and cultural benefits.

Table 5. A classification and examples of ecosystem services (adapted from Daily, 1999)

Production of goods	Food: terrestrial animal and plant products, forage, seafood, spice Pharmaceuticals: medicines, precursors to synthetic drugs Durable materials: natural fibre, timber Energy: biomass fuels, low-sediment water for hydropower Industrial products: waxes, oils, fragrances, dyes, rubber, precursors to synthetic products Genetic resources: the basis for the production of other goods

Regeneration services	Cycling and filtration services: detoxification and decomposition of wastes, renewal of soil fertility, purification of air and water Translocation services: dispersal of seeds necessary for revegetation, pollination of crops and native vegetation
Stabilizing services	Partial stabilization of climate Moderation of weather extremes (e.g., temperature and wind) Regulation of the hydrological cycle Maintenance of coastal and river channel stability Compensation and substitution of one species for another when environments vary Control of the majority of potential pest species
Life-fulfilling services	Provision of aesthetic beauty, cultural, intellectual and spiritual inspiration Existence value Scientific discovery Serenity
Preservation of options	Maintenance of ecological components and systems needed for the future Supply of goods/services awaiting discovery

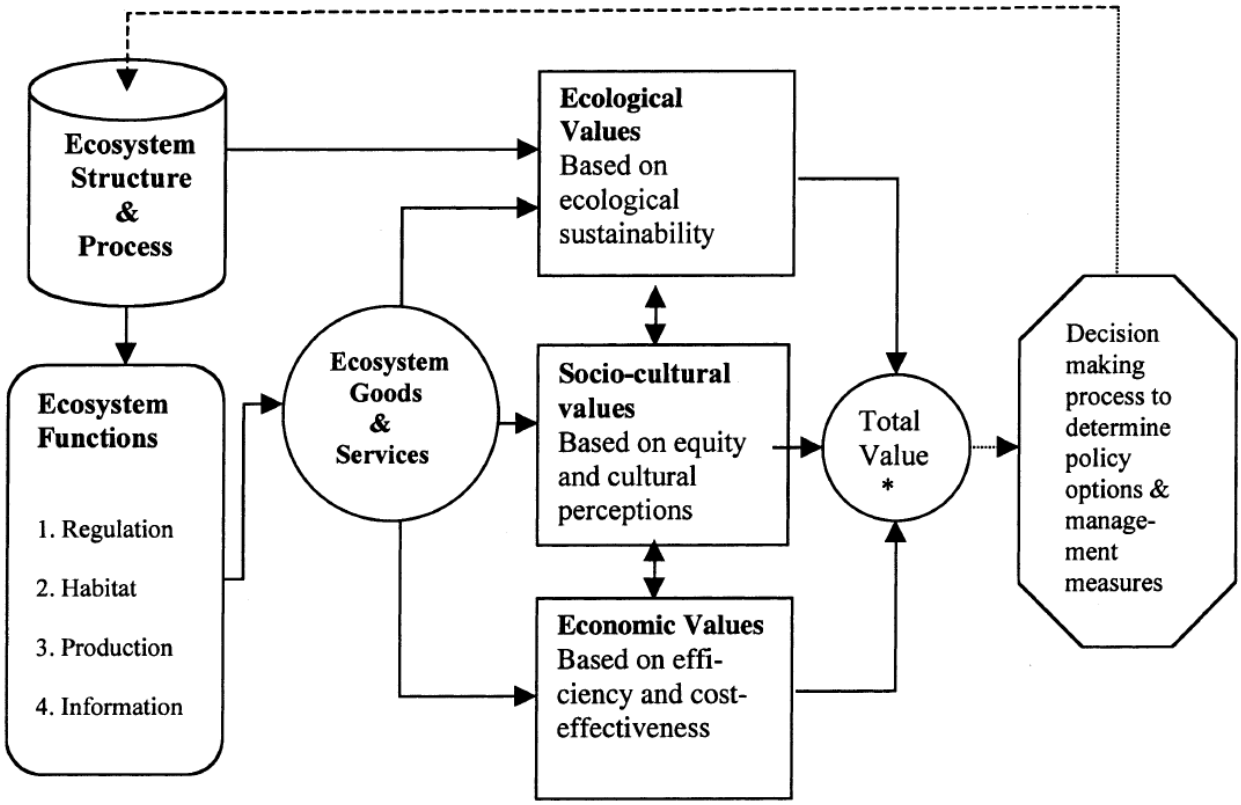


Figure 14. Framework for integrated assessment and valuation of ecosystem functions, goods and services (de Groot et al., 2002).

Ecosystem services can be defined in myriad ways dependant on scale and perspective (Daily, 1997). However, to facilitate comparative ecological economic analyses, de Groot et al. (2002) recently constructed a typology for describing, classifying and valuing ecosystem functions, goods and services.

Economic theory recognizes four kinds of capital –human, financial, manufactured and natural. Ecosystem services are the equivalent of 'natural capital'. Developed economies have focused primarily on using the first three (which were considered limiting factors to development) to transform natural capital (which was considered 'free' and abundant) into consumer products and services (Hawken et al., 1999).

In this study, the classification given in **Table 5** will be used to assess the ecosystem services of the project area.

Production of goods

Food: terrestrial animal and plant products, forage, seafood, spice

Sarikum Lake in the project area and the Black Sea in the north of the project area provide fish for the people of the region. Fish is the main marine food for the population, but smaller quantities of Asian rapa whelk, squid, mussels and sea crabs are also caught. In the project area, 24 of the bird species are game animals and 16 of them are eaten, while 4 of the mammals are game animals and only one of them is eaten.

Pharmaceuticals: medicines, precursors to synthetic drugs

Some local plants have medicinal value and can be traded for the production of certain medicines and chemicals. Details on this will be given in the flora section.

Durable materials: natural fibre, timber

Due to the forested structure of the region, intensive forestry activities are carried out to supply timber, logs and firewood.

Energy: biomass fuels, low-sediment water for hydropower

There is no ecosystem service in this context in the region.

Industrial products: waxes, oils, fragrances, dyes, rubber, precursors to synthetic products

Beekeeping is practiced in the region and candles can be obtained from this activity. This is detailed in the invertebrates section.

Genetic resources: the basis for the production of other goods

There is no ecosystem service in this context in the region.

Regeneration services

Cycling and filtration services: detoxification and decomposition of wastes, renewal of soil fertility, purification of air and water

In the area, especially Sarıkum Lake and the Black Sea in the north of the area fulfill cycling and filtration services.

Translocation services: dispersal of seeds necessary for revegetation, pollination of crops and native vegetation

Beekeeping in the area serves for pollination. In addition, lakes and the sea can function for seed dispersal.

Stabilizing services

Partial stabilization of climate

The lake, forests and sea in the project area contribute to partially stabilizing the climate.

Moderation of weather extremes (e.g., temperature and wind)

The lake, forests and sea in the project area contribute to moderation of weather extremes.

Regulation of the hydrological cycle

The lake, forests and sea in the project area contribute to regulation of the hydrological cycle.

Maintenance of coastal and river channel stability

The lake, forests and sea in the project area contribute to maintenance of coastal and river channel stability.

Compensation and substitution of one species for another when environments vary

Habitat diversity in the area helps Compensation and substitution of one species for another when environments vary.

Control of the majority of potential pest Species

To say something about this issue is not easy now.

Life-fulfillingservices

Provision of aesthetic beauty, cultural, intellectual and spiritual inspiration

Sarikum lake and flooded forest around it is one of the most beautiful area in Sinop Province.

Existence value

Especially flooded forest habitat around Sarikum lake is unique for Türkiye and has existance value. The gorest around Sarıkum lake have all nine woodpecker species in Türkiye.

Scientific discovery

Sarikum Lake and flooded forest habitat around it offer unique ecosystem types and have scientific discovery opportunities.

Serenity

Human population density is quite low in the Sarikum region. The lake, forests and sandy beaches that make up the general habitat types of the region provide an extraordinary serenity.

Preservation of options

Maintenance of ecological components and systems needed for the future

The diversity of ecosystems, forests and water resources (sea and lake) in the region provide ecological components and systems that will be needed in the future.

Supply of goods/services awaiting discovery

As the region has been intensively scientifically explored for many years, it may be unlikely to have a supply of goods/services waiting to be discovered.

REFERENCES

Baran, İ. &Atatür, M.K., 1998, Türkiye Herpetofaunası (Kurbağa ve Sürüngenler), T.C. Çevre Bakanlığı, Ankara.

Baran, İ. & Yılmaz, i., 1984, Ornitoloji Dersleri. Ege Üniversitesi Basımevi. Seri no. 87. Bornova. İzmir. 1-323.

Baran, İ., 2005, Türkiye Amfibive Sürüngenleri, TÜBİTAK PopülerBilimKitapları No: 207 BaşvuruKitaplığı 21, Ankara.

Baran, İ., Avci, A., Kumlutaş, Y., Olgun, K., Ilgaz, Ç., 2021. Türkiye amfibi ve sürüngenleri (in Turkish, Amphibians and Reptiles of Turkey). Palme Yayınevi, Ankara. 221 sayfa.

Baran, İ., Ilgaz, Ç., Avcı, A., Kumlutaş, Y ve Olgun K. 2012, Türkiye Amfibi ve Sürüngenleri, TÜBİTAK Popüler Bilim Kitapları, 204 sayfa, Ankara.

Başoğlu, M. & Baran, İ., 1977, Türkiye Sürüngenleri. I. Cilt: Kaplumbağalar ve Kertenkeleler [The Reptiles of Turkey, Part I. The Turtles and Lizards], EgeÜniversitesi, Fen FakültesiKitaplarSerisi. İzmir, 76: 1-272. 1977.

Başoğlu, M. & Baran, İ., 1988. Türkiye Sürüngenleri. II. Cilt: Yılanlar [The Reptiles of Turkey, Part II. The Snakes], Ege Üniversitesi, Fen Fakültesi Kitaplar Serisi İzmir, 81: 1-218.

Başoğlu, M. &Özeti, N., 1973, Türkiye Amfibileri. Ege Üniversitesi Fen Fakültesi Kitaplar Serisi. İzmir, 50: 1–155.

Benda, P. & Horacek, I., 1998, Bats (Mammalia: Chiroptera) of the Eastern Mediterranean. Part 1. Review of distribution and taxonomy of bats in Turkey. Acta Soc. Zool. Bohem. 62: 255–313.

Burgin C. J., Wilson D. E., Mittermeier R. A., Rylands A. B., Lacher T. E., Sechrest W. (2020) Illustrated Checklist of the Mammals of the World. Volume 1. Monotremata to Rodentia. Lynx Editions, Barcelona.

Burgin C. J., Wilson D. E., Mittermeier R. A., Rylands A. B., Lacher T. E., Sechrest W. (2020) Illustrated Checklist of the Mammals of the World. Volume 2. Eulipotyphla to Carnivora. Lynx Editions, Barcelona.

Çağlar, M., 1965, Türkiye'ninChiropteraFavnası. İstanbul Üniversitesi Fen FakültesiMecmuası, Seri B, 30 (3-4): 125-134.

Çağlar, M., 1968, Türkiye'ninYarasaları I. Türk BiologiDergisi, 18 (1): 5-18.

Çağlar, M., 1969, Türkiye'ninYarasaları II. Türk BiologiDergisi, 19 (2-4): 88-106.

Çolak, R., E. Çolak, N. Yiğit, Kandemir, İ. & Sözen, M., 2007, Morphometric and biochemical variations and the distribution of Genus *Apodemus* (Mammalia: Rodentia) in Turkey, *Acta Zoologica Academiae Scientiarum Hungaricae*, 53 (3), 239-256.

Demirsoy, A., 1996, Türkiye Omurgalıları. Amfibiler. Türkiye Omurgalı Faunasının Sistematik ve Biyolojik Özelliklerinin Araştırılması ve Koruma Önlemlerinin Saptanması. Meteksan AŞ. 69 s.

Demirsoy, A., 1996, Türkiye Omurgalıları. Memeliler. Türkiye Omurgalı Faunasının Sistematik ve Biyolojik Özelliklerinin Araştırılması ve Koruma Önlemlerinin Saptanması, 292 s.

Demirsoy, A., 1996, Türkiye Omurgalıları. Sürüngenler. Türkiye Omurgalı Faunasının Sistematik ve Biyolojik Özelliklerinin Araştırılması ve Koruma Önlemlerinin Saptanması. Meteksan AŞ. 204 s.

Demirtaş, S., Silsüpür, M., Searle, J. B., Bilton, D., & Gündüz, İ. (2020). What should we call the Levant mole? Unravelling the systematics and demography of *Talpa levantis* Thomas, 1906 sensu lato (Mammalia: Talpidae). Mammalian Biology, 100, 1-18.

Doğramacı, S., 1974, Türkiye *Apodemus* (Mammalia: Rodentia)'larınınTaksonomik durumları. Tarım Hayvancılık Bakanlığı Zirai Mücadele Müdürlüğü Araştırma: 1-56, Ankara.

Doğramacı, S., 1989, Türkiye Memeli Faunası. Ondokuz Mayıs Üniv. Fen Fak. Derg. 1 (3). 107–136.

European Commission Convention on Conservation of European Wildlife and Natural Habitats (Bern Convention). 2002. Appexes. [Online].

Felten, H., Spitzenberger, F. & Storch, G., 1971, Zur Kleinsäugerfauna West-Anatoliens. Teil I, Senckenbergiana biol., 52 (6): 393-424.

Felten, H., Spitzenberger, F. & Storch, G., 1973, Zur Kleinsäugerfauna West-Anatoliens. Teil II, Senckenbergiana biol., 54 (4-6): 227-290.

Felten, H., Spitzenberger, F. und Storch, G., 1977, Zur Kleinsäugerfauna West-Anatoliens. Teil IIIa, Senckenbergiana biol., 58: 1-44.

Heinzel, H., Fitter, r. & Parslow, J., 2001, türkiye ve Avrupa'nın Kuşları. Çeviri; Kerem Ali Boyla. Doğal Hayatı Koruma Derneği. 1-384.

IUCN Standards and Petitions Committee. 2022. Guidelines for Using the IUCN Red List Categories and Criteria. Version 15.1. Prepared by the Standards and Petitions Committee. Downloadable from https://www.iucnredlist.org/documents/RedListGuidelines.pdf.

Karahan, F. 2010. SinopKuşları. T.C. SinopValiliği İl Çevreve Orman MüdürlüğüYayını, ŞimalAjans: Sinop.

Karataş, A. & Sözen, M., 2004, Contribution to karyology, distribution and taxonomic status of the Long-winged Bat, *Miniopterus schreibersii* (Chiroptera: Vespertilionidae), in Turkey, *Zoology in the Middle East*, 33: 51-64.

Karataş, A. & Sözen, M., 2007, Karyology of three Vespertilionid bats (Chiroptera: Vespertilionidae) from Turkey" *Acta Zoologica Academiae Scientarium Hungaricae,* 53 (2): 185-192.

Karataş, A., 2009, Türkiye Yarasaları, Niğde Üniv. B.A.P. Birimi Proje No: 01.FEB.09 nolu yayınlanmamış proje raporu.

Kefelioğlu, H., Kryštufek, B., Selçuk, A. Y., Hutterer, R., & Astrin, J. J. (2020). Taxonomic revision of the Levant moles of Turkey (Mammalia: Talpidae). Bonn Zoological Bulletin, 69(2), 275-291.

Kıvanç, E., 1988, Türkiye *Spalax*'larının Coğrafik Varyasyonları (Mammalia; Rodentia) Ankara Üniv., Fen Fak., Biyoloji Böl., 1-88.

Kirwan, G.M, K.A. Boyla, P. Castell, B. Demirci, M. Özen, H. Welch and T. Marlow. (2008). The birds of Turkey: a study of the distribution, taxonomy and breeding of Turkish birds. Christopher Helm. London.

Krystufek, B. &Vohralik, V., 2001, Mammals of Turkey and Cyprus. Introduction, Checlist, Insectivora. Zgodovinskodrustvo za juzno Primorsko Znanstveno-raziskovalnosredisce Republike Slovenije Koper. 140 pp.

Krystufek, B. &Vohralik, V., 2005, Mammals of Turkey and Cyprus. Rodentia I: Scuidae, Dipodidae, Gliridae, Arvicolinae. Zgodovinskodrustvo za juzno Primorsko Znanstveno-raziskovalnosredisce Republike Slovenije Koper. 292 pp.

Kumerloeve, H., 1975, Die Saugetierte (Mammalia) der Turkei. Veröff. Zool. Staatssamlung München. 18: 69-158.

Mursaloğlu, B., 1973, Türkiye Yabani Memelileri. IV. BilimKongresi, 5–8 Kasım 1973, Ankara. 1- 9. 1973.

Niethammer, J. & Krapp, F., 1978, Handbuch der Saugetiere Europas. Wiesbaden (Akademische Verlagsgesellschaft), I: 1–476.

Niethammer, J. & Krapp, F., 1982, Handbuch der Saugetiere Europas. Wiesbaden (Akademische Verlagsgesellschaft) I: 1–649.

Osborn, D.J., 1964, The Hare, Porcupine, Beaver, Squirrels, Jerboas and Dormice of Turkey. Mammalia 28: 578-592.

Özeti, N. & Yılmaz, İ., 1994, Türkiye Amfibileri. Ege Üniversitesi Fen Fakültesi Kitaplar Serisi, No: 151, İzmir, 221 s.

Özkurt ŞO ve Bulut Ş. (2020) Türkiye Memelileri. Panama Yayıncılık. 456 sayfa. Ankara.

Sözen M. Erturhan M, Boyla K. A., Tozsin T. ve Soydaş M. 2015. Zonguldak Kuşları. Gökçe Ofset Ofset Matbaacılık Ltd. Şti. Ankara. XII + 428 sayfa. ISBN: 978-605-4610-77-8.

Spitzenberger, F., 1968, Zur Verbreitung und Systematik türkischer Crocidurinae (Insectivora, Mammalia). Ann. Naturhistor. Mus. Wien, 74: 233-252.

Svensson, L., Zetterström, D. & Mullarney, K., 2010, Birds of Europe: (Second Edition), Princeton University Press, 448 pp.

Turan, N., 1984, Türkiye'nin Av ve Yaban Hayvanları – Memeliler -. Ongun Kardeşler Matbaacılık Sanayii, Ankara, 178 sayfa. 1984.

URL 1: www.kusbank.org

URL 2: www.trakus.org

URL 3: www.tramem.org

URL 3: www.e-bird.org

Wilson, D.E. & Reeder, D.M., 2005, Mammal species of the world: A Taxonomic and Geographical Reference, 3rd ed., Smithsonian Institution Press, Washington.

Yiğit, N., Çolak, E., Sözen, M. & Karataş, A., 2006, Rodents of Türkiye. Meteksan, Ankara. 154 pp.

ANNEX 6. HONEYBEES AND ECOSYSTEM ACCOUNTING OF POLLINATION

Honeybees for Ecosystem Service providers as Pollinators:

Honey bees (*Apis mellifera* L):

Today, honey bees are the most studied insect in the world including Türkiye. One of the main reasons for this is the contribution of honey bees to agricultural economy and also to biodiversity. Türkiye is located in the most important region in the world in terms of honey bee diversity. five different honey bee subspecies and numerous ecotypes are found in our geography (Kandemir 1999, Kandemir and Kence, 1995; Kandemir et al., 2000; 2006). According to a recent study, it is reported that the Central Anatolian honeybee, which is associated with our country, has actually been used in other countries in this geography for thousands of years (Bloch et al. 2010). The research conducted on bees dating back to 3000 years ago found in the apiary obtained in archaeological excavations in Israel was published in Proceedings of National Academy of Sciences, America.

Beekeeping in Sinop:

The position of beekeeping sector in Sinop is not that hive in Türkiye. The number of beekeeping business and the related beekeeping statistics range between 44-68 among 81 cities for the number of Beekeeping Business, number of primitive, modern and total hives, honey production and also bees wax production (**Table 1**).

Table 1. Türkiye provinces beekeeping statistics (2022)

Cities (Lisence Plate No)	Beekeeping Business (#)	Primitive Hive (#)	Modern Hive (#)	Total Hive (#)	Honey production (Ton)	Bees Wax Production (Ton)
Adana-1	2556	1745	492687	494432	12645,9	436,7
Adıyaman-2	1177	658	72989	73647	380,9	17,2
Afyonkarahisar-3	315	300	49799	50099	427,8	10,8
Aksaray-68	352	283	16976	17259	215,1	1,1
Amasya-5	593	340	31963	32303	492,5	18,0
Ankara-6	1507	2315	92170	94485	771,4	28,9
Antalya-7	3236	406	244249	244655	2265,0	116,2
Ardahan-75	658	0	26488	26488	245,0	2,6
Artvin-8	2075	842	108028	108870	640,6	31,0
Aydın-9	1646	661	245280	245941	3143,4	92,1
Ağrı-4	298	0	26245	26245	326,9	9,3
Balıkesir-10	2014	758	179837	180595	2629,2	44,1
Bartın-74	677	130	42570	42700	298,0	20,3
Batman-72	548	43	49707	49750	232,2	2,2
Bayburt-69	614	142	73304	73446	620,0	21,0
Bilecik-11	377	33	16250	16283	127,1	4,4
Bingöl-12	1033	2043	158966	161009	1488,9	49,6
Bitlis-13	931	80643	126477	207120	1210,3	96,8
Bolu-14	682	169	24394	24563	147,4	3,5
Burdur-15	555	454	37662	38116	255,9	32,5
Bursa-16	1675	1158	90511	91669	1141,9	38,2
Denizli-20	1031	0	105931	105931	933,0	72,8
Diyarbakır-21	840	895	145962	146857	1479,8	37,6
Düzce-81	744	0	65903	65903	531,2	16,2
Edirne-22	836	1580	59658	61238	794,7	9,9
Elazığ-23	1508	240	118379	118619	611,2	44,5
Erzincan-24	1219	464	116479	116943	1672,9	33,7
Erzurum-25	2236	4165	151697	155862	2856,8	87,3
Eskişehir-26	394	163	24685	24848	176,3	5,3
Gaziantep-27	346	4438	23685	28123	191,1	3,4
Giresun-28	1870	160	125344	125504	1253,7	54,0

Cities (Lisence Plate No)	Beekeeping Business (#)	Primitive Hive (#)	Modern Hive (#)	Total Hive (#)	Honey production (Ton)	Bees Wax Production (Ton)
Gümüşhane-29	607	253	43199	43452	549,4	22,7
Hakkari-30	1104	9238	154835	164073	796,8	79,2
Hatay-31	925	1221	110738	111959	1114,3	59,7
Isparta-32	543	1737	35484	37221	368,2	30,7
Iğdır-76	291	0	22498	22498	232,2	12,5
Kahramanmaraş-46	1427	2191	120556	122747	1630,5	59,1
Karabük-78	491	70	16280	16350	106,0	3,5
Karaman-70	1049	814	52474	53288	485,6	24,4
Kars-36	460	0	71849	71849	833,4	2,2
Kastamonu-37	1707	7478	79733	87211	359,2	24,9
Kayseri-38	929	1252	61533	62785	532,6	18,8
Kilis-79	114	2760	5419	8179	54,1	1,6
Kocaeli-41	928	690	71563	72253	4725,9	26,0
Konya-42	1481	2237	134122	136359	1322,0	73,3
Kütahya-43	470	661	22297	22958	201,5	8,5
Kırklareli-39	978	5582	53055	58637	473,8	10,4
Kırıkkale-71	236	178	13125	13303	88,6	5,2
Kırşehir-40	173	50	10506	10556	98,5	2,5
Malatya-44	1622	2190	109170	111360	600,2	31,8
Manisa-45	1552	1176	74983	76159	558,7	18,6
Mardin-47	632	556	83035	83591	506,2	22,1
Mersin-33	2720	516	346529	347045	3295,3	284,9
Muğla-48	4894	2223	881873	884096	6577,8	371,3
Muş-49	366	891	58328	59219	446,4	33,8
Nevşehir-50	601	328	18054	18382	133,6	8,1
Niğde-51	417	0	41568	41568	655,9	9,2
Ordu-52	3079	60	609367	609427	19098,3	277,8
Osmaniye-80	815	153	78524	78677	1024,1	24,1
Rize-53	2958	4215	137168	141383	1822,8	38,5
Sakarya-54	1175	218	95639	95857	1390,2	52,4
Samsun-55	1690	461	92874	93335	1032,1	31,6
Siirt-56	978	55598	122897	178495	2497,7	6,4

Cities (Lisence Plate No)	Beekeeping Business (#)	Primitive Hive (#)	Modern Hive (#)	Total Hive (#)	Honey production (Ton)	Bees Wax Production (Ton)
Sinop-57	**845**	**165**	**29566**	**29731**	**256,7**	**10,1**
Sivas-58	3552	995	286109	287104	6078,8	384,9
Tekirdağ-59	1178	605	67541	68146	758,4	13,3
Tokat-60	826	346	49894	50240	520,8	24,3
Trabzon-61	2643	224	169549	169773	2171,8	77,9
Tunceli-62	939	297	82959	83256	963,0	33,9
Uşak-64	153	535	6805	7340	88,5	0,0
Van-65	927	25445	152015	177460	2459,8	160,3
Yalova-77	371	112	30421	30533	317,3	8,9
Yozgat-66	573	685	34139	34824	475,9	28,0
Zonguldak-67	1635	168	65582	65750	279,1	14,3
Çanakkale-17	1617	1080	89414	90494	1890,3	89,4
Çankırı-18	1429	460	56355	56815	654,5	22,0
Çorum-19	888	812	48901	49713	544,8	29,7
İstanbul-34	1357	260	86809	87069	980,0	29,5
İzmir-35	2967	2306	284873	287179	3515,5	72,0
Şanlıurfa-63	738	2176	155025	157201	2199,1	26,2
Şırnak-73	793	2842	65431	68273	325,0	23,3
The rank of Sinop in Türkiye	**44/81**	**62/81**	**68/81**	**66/81**	**65/81**	**59/81**

Beekeeping in Sarikum, Central District

Sarikum neighborhood is belonging to Central District of Sinop. However the similar situation is seen as this district is not very high ranked in Sinop based on above statistical values.

Table 2. The beekeeping statistics of Sinop Districts

Sinop Districts	# of Beekeeping Business	Primitive Hive	Modern Hive	Total # of hives	Honey (ton)	Bees Wax (ton)
Ayancık	210	0	6937	6937	65,00	2,30
Boyabat	65	20	4775	4795	35,35	0,35
Dikmen	51	55	1856	1911	12,34	0,15
Durağan	43	0	1795	1795	16,50	0,00
Erfelek	100	0	4968	4968	49,68	1,25
Gerze	205	90	1950	2040	27,30	0,18
Merkez	**30**	**0**	**2068**	**2068**	**20,54**	**1,02**
Saraydüzü	18	0	612	612	7,00	0,20
Türkeli	123	0	4605	4605	23,01	4,60
Central district rank	**8/9**	**4/9**	**5/9**	**5/9**	**6/9**	**4/9**

Importance of honey bees:

After 2006, the loss of honeybees has been felt and this issue has been mentioned in all kinds of media starting from the USA, France, and other European countries and in our country. However, the words of Albert Eistein rezonated the most:

"If bees disappear from the earth, man will only have 4 years to live. Without bees there would be no fertilisation, no plants, no animals, no humans. "

What Einstein wants to point out here is the importance of bees and insects for mankind and the need for insects in the needs of mankind, i.e. **Pollination**. It is also highly ironic that this voice comes from the USA. However, the honey bee is an insect native to the Old World and was brought to the Americas during the colonisation of the continent and tried to be adapted. From the late 1700s to the 1900s, about 10 subspecies of honey bees distributed worldwide were taken to the USA and used as the main pollinator in agriculture (Sheppard, 1989a,b; Robinson et al., 1989a,b; Soutwick and Soutwick 1989, 1992).

Paragraph 3 of the introduction in the work of Çalmaşur and Özbek in the Turkish Journal of Biology in 1999 is extremely important in terms of summarising this issue scientifically:

"*Pollination in cereals and many other plants, especially wheat and maize with the help of wind. However, fruits such as apple, pear, peach, apricot, cherry, cherry etc. trees; forage crops such as clover, sainfoin, meadow clover, white clover, vetch, etc.; industrial crops such as sunflower, safflower, rape, cotton, sugar beet; vegetables such as melon, watermelon, squash, many other cultivated plants and many wild plants are in absolute need of bees for pollination. In fact, seed setting is almost impossible without bees in many plants (Free, 1983; McGregor, 1976; Özbek, 1986; Özbek 1992).*"

In addition to honey bees, other species visiting sunflower fields were also examined in the study. Although it is stated that other species also contribute a lot to pollination, 88 of the insects or pollinators detected on sunflower tables were honey bees. Based on this study and the referenced literature studies, it is reported that increases of 55% in some characters and 30% in some others are reported to increase according to the presence of pollinators. Since it is known that more than 80% of these pollinators are honey bees, it can be considered that the average contribution of honey bees to sunflower pollination is around 30%.Based on the report prepared by Breeze et al. (2022) on the " Economic Benefits of Pollination to Global Food Systems – Evidence and Knowledge Gaps: Final Report" among G20 countries Türkiye has a 31.4% animal dependence for pollination based on the SEEA UN. As it is mentioned more than 80% of these were the honeybees and average dependence on honeybees is 25%. Although different indices are used for valuating pollination services it results more or less the same result.

It is also stated in agriculture related pages that this is not only valid for sunflower but for all crops. The following information can be found on the website of Edirne Provincial Directorate of Agriculture (http://www.edirnetarim.gov.tr/aricilik/genel_aricilik.htm).

If there are enough honey bee colonies in the production area of cultivated plants, the contribution will be realised by honey bees. Therefore, the effect of honey bees is extremely high not only in sunflower but also in many other crops.

Sunflower	% 25-50
Cotton	% 34-40
Clover	% 50-60
Apple and Pear	% 50-60
Cucumber	% 75-90
Melon, Cantolope and Watermelon	% 95-100
Tomatoes	% 25-30
Grape	% 25-30
Sainfoin, clover and vetch	% 35-40

Methodology:

The most common formula for calculating the economic value of pollination is given below (Gallai et al., 2009; Barfield et al., 2012):

Economic Value of Pollination = Σ (P*Q*D)

For all crops, Q is the quantity of the crop, P is the price per unit of the crop and D is the dependence on insect pollination.

If the economic value of honey bees is particularly desired here, then the economic value of honey bees in pollination can be calculated directly by multiplying this equation by the proportion of honey bees in the D value. The most contradictory situation in this issue is the D value. This situation was discussed in Gallai et al (2009) and average values were calculated from the values obtained in many studies and used. It is relatively easy to measure this value in agriculture, but it is almost impossible to calculate the pollination by wild bees in natural ecosystems. The dependence of different crops in agricultural production on insect pollination and the proportion of honey bees in this dependence is given in **Table 3** (Morse and Calderon, 2000).

Table 3. Estimated effect of honey bees on crop productivity

Products	Dependence on Insect Pollination (%)	The proportion of honey bees in insect pollination (%)
Clover	100	60
Apple	100	90
Almond	100	100
Citrus	20-80	10-90
Soy bean	10	50
Onion	100	90
Brocoli	100	90
Carrot	100	90
Sunflower	100	90
Other fruits: Apricot, avacado, grape, peach, plum, sweet cherry, sour cherry, kiwi, pear, strawberry, olive	10-90	10-90
Other vegetables: cauliflower, celery, cucumber, squash, melon, cantalope, watermelon	70-100	10-90
Other products: peanut, canola, sugar beat	10-100	20-90

In 2000, in the USA, these authors have economically quantified the pollination value of honey bees using an equation similar to the one above, in relation to their use as pollinators in agriculture. The formula used here is as follows:

The value of honey bees in agriculture = V*D*P

In this equation, V is the average value of the crop over the last 3 years; D is the dependence of the crop on insect pollination; P is the proportion of honey bees among pollinators. In this way, the contribution of honey bees to the US agricultural economy between 1996-1998 was calculated as approximately 15 billion dollars. The products and values used in the study are given in **Table 4**.

Table 4. Economical value of pollination in the USA

Product	1996-98 average product values (million $)	Dependence on Insect Pollination	The proportion of honey bees in insect pollination	The value attributed to honey bees, **V*D*P,** (mil**li**on $)
Almond	959.2	1	1	959.2
Apple	1502.6	1	0.9	1353.2
Apricot	37.8	0.7	0.8	21.2
Avacado	254.6	1	0.9	229.2
Blue berry	151.3	1	0.9	136.1
Black berry	64.8	0.8	0.9	46.7
Sweet cherry	242.4	0.9	0.9	196.3
Sour cherry	43.4	0.9	0.9	35.1
Grapefruit	297.4	0.8	0.9	214.1
Lemon	268.2	0.2	0.1	53.6
Lime	5.8	0.3	0.9	1.6
Orange	1869.8	0.3	0.9	504.9
Grapefruit-Tangerine hybrid	16.4	0.4	0.9	5.9
Tangerine	112.5	0.5	0.9	50.6
Temple	12.4	0.3	0.9	3.4
Cranberry	294.9	1	0.9	265.4
Grape	2704.6	0.1	0.1	27
Kiwi	18.1	0.9	0.9	14.6
Australian hazelnut	41.6	0.9	0.9	33.7
Nectarin	108.1	0.6	0.8	51.9
Olive	70.2	0.1	0.1	0.7
Peach	426	0.6	0.8	51.9
Pear	291.2	0.7	0.9	183.5
Plum	243.6	0.7	0.9	153.5
Strawberry	900.1	0.2	0.1	18.0
Asparagus	183.2	1	0.9	164.9
Brocoli	483.8	1	0.9	435.4
Carrot	467.5	1	0.9	420.7
Cauliflower	233.5	1	0.9	210.2
Celery	230.1	1	0.8	184.1
Cucumber	346.8	0.9	0.9	280.9
Cantalope melon	395.7	0.8	0.9	284.9
Winter melon	91.7	0.8	0.9	66.0

Onion	735.3	1	0.9	661.7
Pumpkin	200.0	0.9	0.1	18.0
Zuccini	240.5	0.9	0.1	21.6
Vegetable seeds	61.0	1	0.9	54.9
Water melon	286.6	0.7	0.9	180.5
Clover seeds	109	1	0.6	65.4
Clover hay	7647.9	1	0.6	4588.8
Cotton lint	4556.8	0.2	0.8	729.1
Cotton seeds	803.9	0.2	0.8	128.6
Legume seeds	34.1	1	0.9	30.7
Peanut	1013.7	0.1	0.2	20.3
Rapeseed	0.4	1	0.9	0.4
Soy bean	16490.7	0.1	0.5	824.5
Sugar beat	951.5	0.1	0.2	19.0
Sunflower	455.4	1	0.9	409.9
TOTAL	**47107.2**			**14463.6**

The contribution of honey bees to pollination was calculated based on the agricultural products in SinopSarıkum and the surrounding buffer zone. The product value obtained in the calculations of the value of pollination will be found by multiplying the product value obtained in the calculations of the value of pollination by the insect dependence of the product in pollination and also by the dependence on honey bees among insects, and the contribution of honey bees to ecosystem services through pollination will be determined. After collection of data from Turkish Statistical Institute the value of crop pollination based on the Central district of Sinop including Sarıkum was determined.

REFERENCES

Barfield, A., Bergstorm, J., Ferreira, S. 2012. Ancconomic valuation of pollination services in Georgia. Southern Agricultural Economics Association Annual Meeting, Birmingham, AL, Feb 4-7, 2012.

Bloch, G., Francoy, T.M., Wachtel, I., Panitz-Cohen, N., Fuchs, S., and Mazar, A. 2010. Industrial apiculture in the Jordan valley during Biblical times with Anatolian honeybees. Proceedings of National Academy of Sciences 107, 25:11240-11244.

Breeze T.D., Garratt M.P.D., Senapathi D., Willcox B.K. and Potts S.G. 2022. Economic Benefits of Pollination to Global Food Systems – Evidence and Knowledge Gaps: Final Report. NERC-281022- FullReport SEEA UN.

Free, J. B., Insect Pollination of Crops. Academic Press Inc. London, 684, 1993.

Gallai, N., J.-M. Salles, J. Settele and B. E. Vaissiere. 2009. “Economic Valuation of the Vulnerability of World Agriculture Confronted with Pollinator Decline.”Ecological Economics 68: 810-821.

Kandemir, İ., Kence, A. 1995. Allozyme variation in Central Anatolian honey bee (Apis mellifera L.) populations Apidologie, 26: 503-510.

Kandemir, İ (1999) Genetic and Morphometric Variation in Honeybee populations (Apis mellifera L.) in Turkey. Ph.D Thesis, METU, Ankara.

Kandemir, I; Kence, M; Kence, A. 2000. Genetic and morphometric variation in honeybee (Apis mellifera) population of Turkey. Apidologie 31: 343–356.

Kandemir, I., M. Kence, W.S. Sheppard, A. Kence (2006) Mitochondrial DNA variation in honey bee (Apis mellifera L.) populations from Turkey. Journal of Apicultural Research, 45(1): 33-38.

McGregor, S.E., Insect Pollination of Cultivated Crop Plants. Agric. Handbook No: 496, US Dept. Agr., 345-349 1976.

Morse, R.A., and N.W. Calderone, The Value of Honey Bees as Pollinators of U.S. Crops in 2000, March 2000,

Özbek, H., Arılarve bitki yetistiriciligi. Hasad, 1 (10), 18-19, 1986.

Özbek, H., Balarısı (Apis mellifera L.)’nınbitkilerintozlaşmasındakullanılması. Doğu Anadolu Bölgesi I. ArıcılıkSemineri, 3-4 Haziran 1992, Erzurum. Atatürk Üniv. Ziraat Fak., 48-60, 1992.

Sheppard, W.S. 1989a. A history of the introduction of honey bee races into the United States. Part I. American Bee Journal, 129: 617–619.

Sheppard, W.S. 1989b. A history of the introduction of honey bee races into the United States. Part II. American Bee Journal, 129: 644–667.

Southwick, E.E., Southwick, L. 1992. Estimating economic value of honey bees (Hymenoptera: Apidae) as agricultural pollinators in the United States. Journal of Economic Entomology, 85: 621–633.

Southwick, L., Southwick, E.E. 1989. A comment on “The value of honey bees as pollinators of US crops” American Bee Journal, 129: 805-807.

Robinson, W.S., Nowogrodzki, R., Morse, A. 1989a. The value of honey bees as pollinators of US crops. Part I. American Bee Journal, 129(6): 411–423.

Robinson, W.S., Nowogrodzki, R., Morse, A. 1989b. The value of honey bees as pollinators of US crops. Part II. American Bee Journal, 129(7): 477–487.

ANNEX 7. INVERTEBRATE FAUNA[8]

INVERTEBRATES

Introduction

Monitoring animal communities in terrestrial ecosystems is important component elements in an ecosystem structure; due to the fact that they are in a permanent and close contact with most important man-made factors that has an impact on the environment especially considering the ecosystem services they provide as pollinators (IFC and EBRD requirements)

For the monitoring of wildlife in an environmental includes routine surveillance over the major taxonomic groups of animals distributed in the Sinop region (invertebrates, amphibian,reptiles, birds and mammals), parameters of inhabitation, state and size of population, population distribution at the studied territory, dominant population have been determined. During field survey reproduction and biodiversity criterias have been applied and national and international criteria of nature protection, (IUCN, BERN, CITES), endemism status have been updated.

Data was gathered by the invertebrate expert at the project site, its impact are and at the terrestrial ecosystem in which the project site is found and also conversations were made with the local residents. Moreover, former studies about the terrestrial invertebrates at the project site and ecosystem areas in which the project site is included were evaluated. Invertebrates that were collected on site were used in the identification of the species living at the area.

During the field work, in order to determine the invertebrate species, the expert made observations at stone bottoms, rock clefts, different mediums such as old structures and forest areas where these livings likely to be found.

The project site is currently an anthropogenic area and the species living at the area are the ones that can survive within this anthropogenic structure.

The literature utilized in the identification of the species at the project site is given in References section.

The categories and their abbreviations given in the tables are as follows:

BERN (Bern Convention)

Appendix - II: Strictly Protected Fauna Species (SPFS)

[8]All photos are taken by Mustafa Sozen on 26-27 January 2023.

Appendix - III: Protected Fauna Species (PFS)

IUCN (International Union for Conservation of Nature and Natural Resources) Red List Categories (Version 2009.1)

EX (Extinct): There is no reasonable doubt that the last individual has died.

RE (Regionally Extinct)

EW (Extinct in the Wild): Only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range.

Risk Categories

CR (Critically Endangered): Species considered to be facing an extremely high risk of extinction in the wild.

EN (Endangered): Species considered to be facing a very high risk of extinction in the wild.

VU (Vulnerable): Species considered to be facing a high risk of extinction in the wild.

Low Risk Categories

NT (Near Threatened): Species close to qualifying for or is likely to qualify for a threatened category in the near future.

LC (Least Concern): Widespread and abundant species.

DD (Data Deficient): Species for which there is inadequate information.

NE (Not Evaluated): Species that has not yet been evaluated against the criteria.

END (Endemic)

NA (Not Applicable for IUCN)

NRL (National Redlist for Butterflies)

To evaluate national red list categories of butterfly species the book of " *Red Book of Butterflies in Turkey* " (Karaçetin et al. 2011b) was used. The categories used in this book is the same with used by IUCN. Out of these categories the abbreviation "EY" was used in this report and it means "close to endemic".

CITES Categories

Appendix-1 List includes species that are threatened with extinction and thus international trade in specimens of these species is prohibited, except when the purpose of the import is not commercial.

Appendix-2 List includes species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled.

Appendix-3 List includes species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation.

2015-2016 Central Game Commission (MAK) Decrees

Appendix-I: List of game animals protected by MAK.

Appendix-II: List of game animals whose hunting is allowed for certain periods for 2015-2016 season.

PM:List of wild animals Protected by the Ministry of Forestry and Water Works. This goup of animals excluded ftom the MAK lists and now listed only by the Ministry of Forestry and Water Works.

Literature Review

In this study, the sources used for identification of the species and/or used for literature survey were listed below in reference section. Besides these, the websites having database features such as the website on the butterflies of Türkiye (www.trakel.org) are used to gather information on the invertebrates of the region.

Field Surveys

Field surveys was carried out during January 2023 by baseline study. During the baseline study, the invertebrates were observed and photographed.

INVERTEBRATES

Species from 8 orders of the terrestrial invertebrates were determined, namely LEPIDOPTERA, ODONATA, HYMENOPTERA, MANTODEA, COLEOPTERA, DIPTERA, DERMAPTERA, ORTHOPTERA, and HEMIPTERA. A total of 150 different species were determined in the study area.

LEPIDOPTERA:

The number of Lepidoptera species detected on site is 84. The number of species and individual is higest invertebrate group of at the area. The information on the Lepidoptera species is given in **Table 1**; while photographs are presented in **Figure 1-2.**

Protection Status of the Lepidoptera *Species detected at the Project Site*

According to NRL Red List

In accordance to the results of assessment of the National Red List prepared and updated by NRL, among the Lepidoptera species recorded at the project site and its vicinity, 2 species are in EY (close to endemic) and 51 species are in LC (Least Concern) category.

ODONATA:

The number of Odonata species detected on site is 19. The information on the Odonata species is given in **Table 2**; while photographs are presented in **Figure 3.**

Protection Status of the Odonata Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Odonata species detected at the project site and its vicinity, 19 species is in "LC" (Least Concern) in low risk categories.

HYMENOPTERA:

The number of Hymenoptera species detected on site is 5. The information on the Hymenoptera species is given in **Table 3**; while photographs are presented in **Figure 4.**

Protection Status of the Hymenoptera Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Hymenoptera species detected at the project site and its vicinity, there is no information about the conservation status.

MANTODEA:

The number of Mantodea species detected on site is 2. The information on the Mantodea species is given in **Table 4** and **Figure 5.**

Protection Status of the Mantodea Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Mantodea species detected at the project site and its vicinity, there is no information about the conservation status.

COLEOPTERA:

The number of Coleoptera species detected on site is 26. The information on the Coleoptera species is given in **Table 5**; while some photographs are presented in **Figures 6.**

Protection Status of the Coleoptera Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Coleoptera species detected at the project site and its vicinity, there is no information about the conservation status.

DIPTERA:

The number of Diptera species detected on site is 2. The information on the Diptera species is given in **Table 6**.

Protection Status of the Diptera Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Diptera species detected at the project site and its vicinity, there is no information about the conservation status.

DERMAPTERA:

The number of Dermaptera species detected on site is 1. The information on the Dermaptera species is given in **Table 7**.

Protection Status of the Dermaptera Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Dermaptera species detected at the project site and its vicinity, there is no information about the conservation status.

ORTHOPTERA:

The number of Dermaptera species detected on site is 1. The information on the Dermaptera species is given in **Table 8**.

Protection Status of the Dermaptera Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Orthoptera species detected at the project site and its vicinity, there is no information about the conservation status.

HEMIPTERA:

The number of Hemiptera species detected on site is 10. The information on the Hemiptera species is given in **Table 9**; while photographs are presented in **Figure7.**

Protection Status of the Hemiptera Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the Hemiptera species detected at the project site and its vicinity, there is no information about the conservation status.

Table 1. Butterfly (LEPIDOPTERA) Species Detected at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
LEPIDOPTERA							
Pieridae							
Pieris rapae	KüçükBeyazmelek	Small White	LC	-	-	-	-
Pieris brassicae	Büyük beyazmelek	Large White	LC	-	-	-	-
Colias crocea	Sarı Azamet	Dark Clouded Yellow	LC	-	-	-	-
Gonepteryx rhamni	Orakkanat	Brimstone	-	-	-	-	-
Anthocharis cardamines	Turuncusüslü	Orange tip	LC	-	-	-	-
Aporia crataegi	Alıçbeyazı	Black-veined White	LC	-	-	-	-
Leptidea sinapis	Narinormanbeyazı	Wood white	LC	-	-	-	-
Pontia edusa	Yeni beneklimelek	Eastern Bath White	LC	-	-	-	-
Argynnidae							
Vanessa atalanta	Atalanta	Red Admiral	LC	-	-	-	-
Cynthia cardui	Diken Kelebeği	Painted Lady	LC	-	-	-	-
Satyridae							
Coenonympha pamphilus	KüçükZıpzıpPerisi	Small Heath	LC	-	-	-	-
Lasiommata maera	Esmer Boncuk	Large Wall Brown	LC	-	-	-	-
Pararge aegeria	Karanlık Orman Esmeri	Speckled Wood	LC	-	-	-	-
Coenonympha arcania	Funda zıpzıpperisi	Pearly Heath	-	-	-	-	-
Erebia aethiops	İskoçgüzelesmeri	Scotch argus	LC	-	-	-	-

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Erebia medusa	Orman güzelesmeri	Woodland ringlet	LC	-	-	-	-
Brintesiacirce	Karamurat	Great Banded Grayling	-	-	-	-	-
Hipparchia aristaeus	Güney kızılmeleği	Southern Grayling	LC	-	-	-	-
Hipparchia fatua	Anadolu karameleği	Freyer's Grayling	LC	-	-	-	-
Hipparchia pellucida	Anadolu kızılmeleği	Grayling	LC	-	-	-	-
Hipparchia syriaca	Büyük karamelek	-	LC	-	-	-	-
Lasiommata megera	Küçükesmerboncuk	Wall brown	LC	-	-	-	-
Maniola jurtina	Çayıresmeri	Meadow brown	LC	-	-	-	-
Melanargia galathea	Orman melikesi	Marbled white	LC	-	-	-	-
Pyronia tithonus	Pironiya	Gatekeeper	LC	-	-	-	-
Lycaenidae							
Lampides boeticus	Lampides	Long-tailed Blue, Pea Blue	LC	-	-	-	-
Polyommatus icarus	Çokgözlü Mavi	Common Blue	LC	-	-	-	-
Celastrina argiolus	Kutsal Mavi	Holly Blue	LC	-	-	-	-
Agrodiaetus sp.	Agrolar-belirsiz	Agrodiaetus-Undefined	LC	-	-	-	-
Callophrys rubi	Zümrüt	Green hairstreak	LC	-	-	-	-
Cupido alcetas	Fransızeveresi	Provençal short-tailed blue	LC	-	-	-	-
Cupido argiades	Everes	Short-tailed blue	LC	-	-	-	-
Cupido osiris	Mavi osiris	Osiris blue	LC	-	-	-	-
Glaucopsyche alexis	Karagözmavisi	Green-Underside Blue	LC	-	-	-	-

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Leptotes pirithous	Mavizebra	Common Zebra Blue	LC	-	-	-	-
Lycaena dispar	Büyükbakır	large copper	NT	-	-	-	-
Lycaena phlaeas	Beneklibakırkelebeği	Common copper	LC	-	-	-	-
Lycaena virgaureae	Orman bakırı	scarce copper	LC	-	-	-	-
Lycaena thersamon	Küçükateş	Lesser Fiery Copper	LC	-	-	-	-
Lycaena tityrus	İslibakır	Sooty Copper	LC	-	-	-	-
Palaeochrysophanus candens	Ateşbakırı	Balkan Copper	-	-	-	-	-
Plebejus idas	Idasmavisi	Idas Blue	LC	-	-	-	-
Plebejus modicus	Anadolu esmergözü	-	-	-	-	-	-
Plebejus argus	Gümüş lekeliesmergöz	Silver-studded blue	LC	-	-	-	-
Polyommatus anteros	Çokgözlübalkanmavisi	Blue Argus	LC	-	-	-	-
Polyommatus agestis	Çokgözlüesmer	Brown Argus	LC	-	-	-	-
Polyommatus ripartii	Ripart'ın anormal çokgözlüsü	Ripart's Anomalous Blue	LC	-	-	-	-
Polyommatus bellargus	Çokgözlügökmavisi	Adonis blue	LC	-	-	-	-
Polyommatus corydonius	Yalancıçillimavi	False Chalkhill Blue	LC	-	-	-	-
Polyommatus daphnis	Çokgözlüdafnis	Meleager's blue	LC	-	-	-	-
Polyommatus amandus	Amanda mavisi	Amanda's Blue	LC	-	-	-	-
Polyommatus thersites	Çokgözlümenekşemavisi	Queen of Spain Frittillary	LC	-	-	-	-
Polyommatus icarus	Çokgözlümavi	Comma butterfly	LC	-	-	-	-

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Satyrium acaciae	Minik Sevbeni	Sloe Hairstreak	LC	-	-	-	-
Satyrium ilicis	Büyük Sevbeni	Ilex Hairstreak	LC	-	-	-	-
Carcharodus alceae	Hatmizıpzıpı	Mallow Skipper	LC	-	-	-	-
Erynnis tages	Paslızıpzıp	Dingy skipper	LC	-	-	-	-
Hesperia comma	Gümüş beneklizıpzıp	Silver-spotted skipper	LC	-	-	-	-
Ochlodes venatus	Orman zıpzıpı	Large Skipper	LC	-	-	-	-
Pyrgus armoricanus	İspanyolzıpzıpı	Oberthür's grizzled skipper	LC	-	-	-	-
Pyrgus malvae	Ebegümecizıpzıpı	Grizzled skipper	LC	-	-	-	-
Spialia orbifer	Kızılzıpzıp	Orbed red-underwing skipper	LC	-	-	-	-
Thymelicus lineolus	Siyah antenlizıpzıp	Essex Skipper	LC	-	-	-	-
Thymelicus sylvestris	Sarıantenlizıpzıp	Small skipper	LC	-	-	-	-
Papilionidae							
Iphiclides podalirius	Erik kırlangıçkuyruğu	Scarce Swallowtail	LC	-	-	-	-
Papilio machaon	Kırlangıçkuyruk	Old World swallowtail	LC	-	-	-	-
Zerynthia cerisyi	Ormanfistosu	Eastern Festoon	-	-	-	-	-
Nymphalidae							
Aglais urticae	Aglais	Small tortoiseshell	LC	-	-	-	-
Argynnis adippe	Büyükinci	High brown fritillary	LC	-	-	-	-
Argynnis pandora	Bahadır	Cardinal	LC	-	-	-	-
Argynnis aglaja	Güzelinci	Dark green fritillary	LC	-	-	-	-

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Argynnis paphia	Cengaver	Silver-washed fritillary	LC	-	-	-	-
Boloria euphrosyne	Beyazinci	Pearl-bordered fritillary	LC	-	-	-	-
Euphydryas aurinia	Nazuğum	Marsh fritillary	LC	-	-	-	-
Inachis io	Tavuskelebeği	European Peacock	LC	-	-	-	-
Issoria lathonia	İspanyolkraliçesi	Queen of Spain fritillary	LC	-	-	-	-
Limenitis reducta	Akdeniz hanımelikelebeği	Southern White Admiral	LC	-	-	-	-
Melitaea athalia	Amannissa	heath fritillary	LC	-	-	-	-
Melitaea fascelis	Güzel iparhan	Lesser Spotted Fritillary	LC	-	-	-	-
Melitaea phoebe	Beneklibüyükiparhan	Knapweed Fritillary	LC	-	-	-	-
Melitaea didyma	Benekliiparhan	Spotted Fritillary	LC	-	-	-	-
Melitaea cinxia	İparhan	Glanville fritillary	LC	-	-	-	-
Nymphalis polychloros	Karaağaç nimfalisi	Blackleg tortoiseshell	LC	-	-	-	-
Polygonia c-album	Yırtıkpırtık	Comma butterfly	LC	-	-	-	-

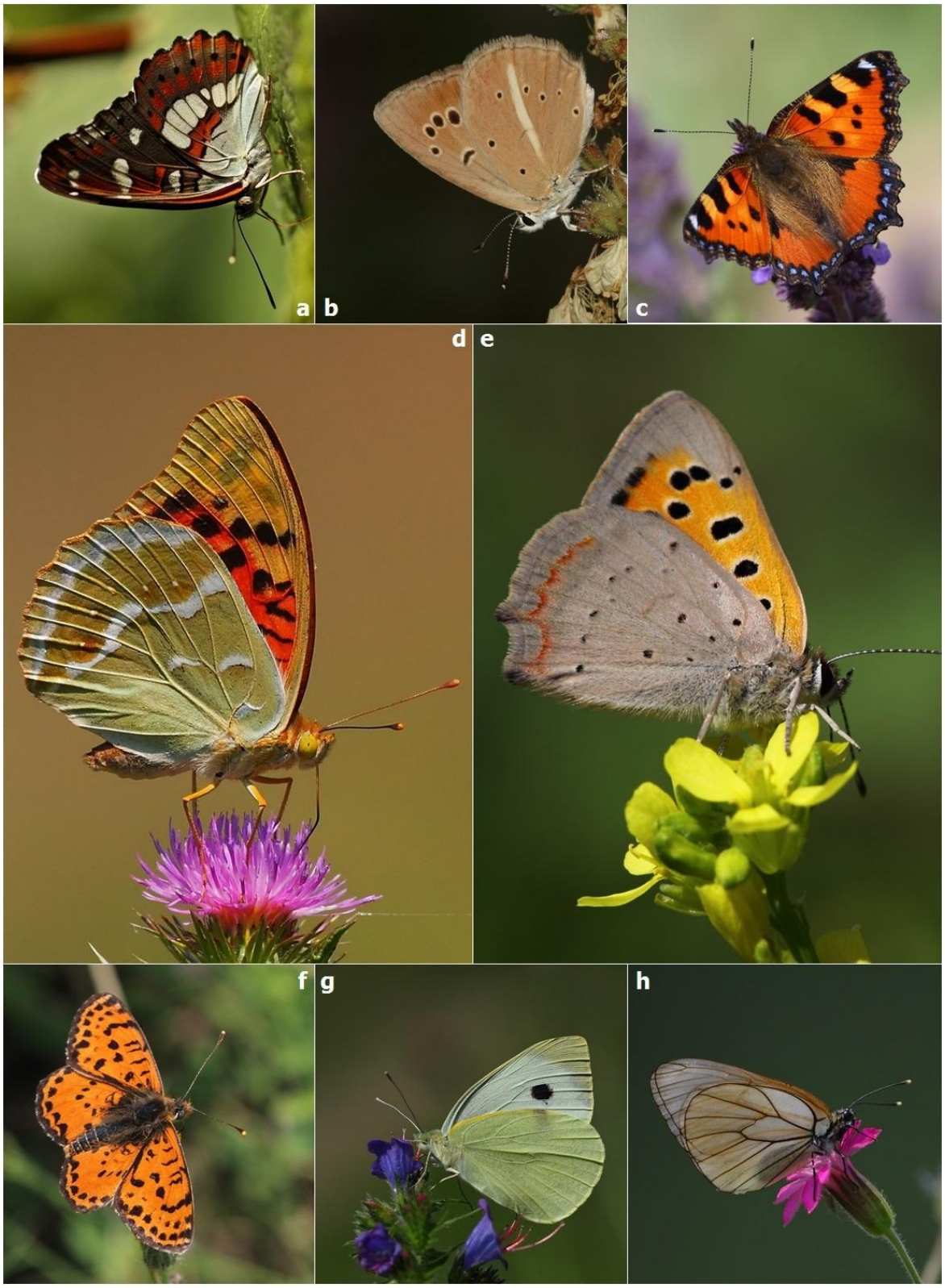


Figure 1. Photographs of some butterfly species determined in study area. a. *Limenitis reducta*, b. *Agrodiaetus* sp., c. *Aglais urticae*, d. *Argynnis pandora*, e. *Lycaena phlaeas*, f. *Melitaea didyma*, g. *Pieris brassicae*, h. *Aporia crataegi*. (@ Sözen).

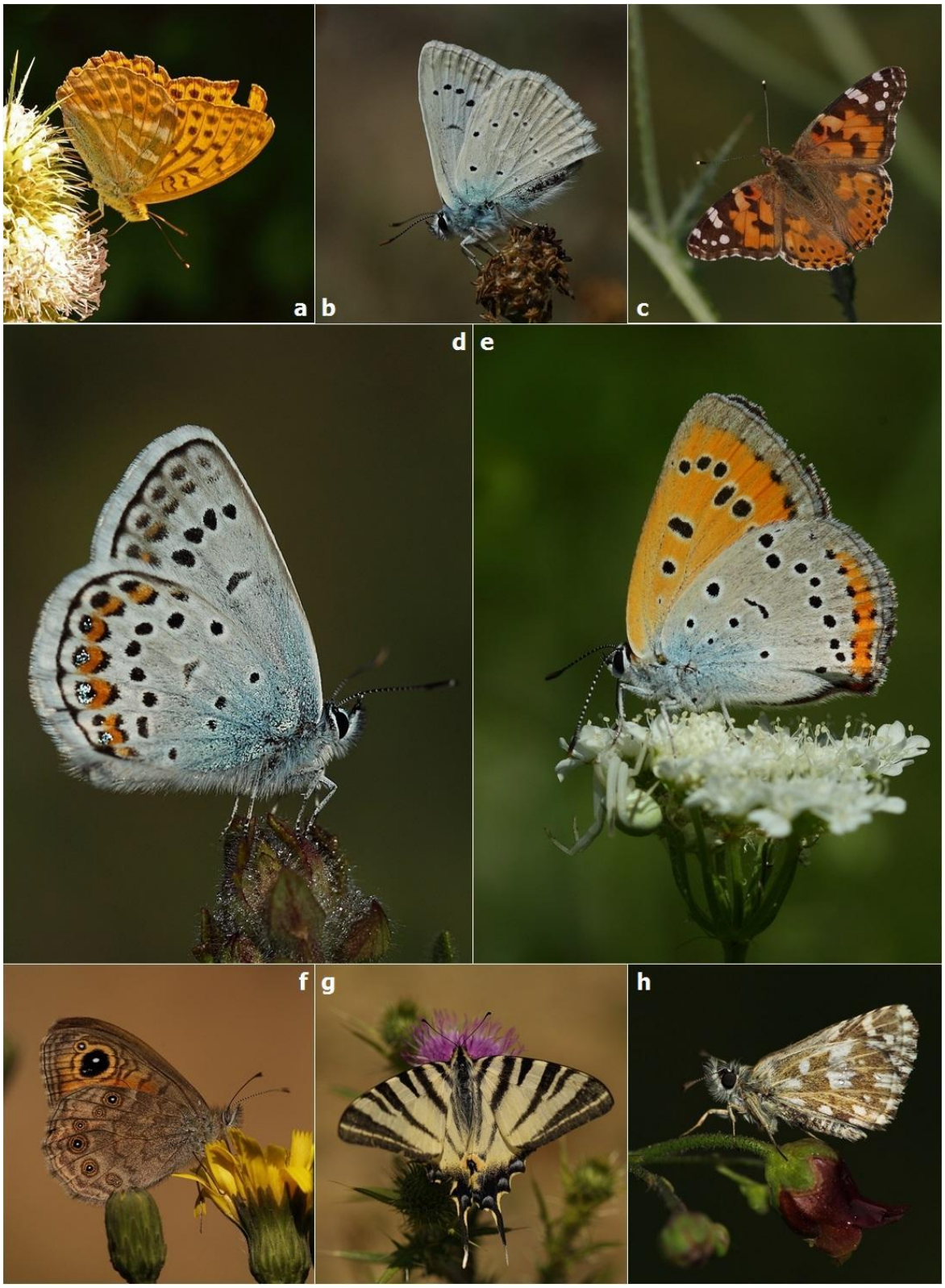


Figure 2. Photographs of some butterfly species determined in study area. a. *Argynnis paphia*, b. *Polyommatus daphnis*, c. *Cynthia cardui*, d. *Plebejus argus*, e. *Lycaenadispar*, f. *Lasiommata maera*, g. *Iphiclides podalirius*, h. *Pyrgus malvae*. (@ Sözen).

Table 2. Dragonfly and Damselfy (ODONATA) species detected at the study area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
ODONATA							
ANISOPTERA							
Aeshnidae							
Anax imperator	Büyük kralyusufcuk	Emperor Dragonfly	LC	-	-	-	-
Aeshna affinis	Güney yırtıcıyusufçuğu	Blue-eyed hawker	LC	-	-	-	-
Aeshna isoceles	KüçükYırtıcıyusufcuk	green-eyed hawker	LC	-	-	-	-
Libellulidae							-
Libellula depressa	Gerçeksubakiresi	Broad-bodied darter	LC	-	-	-	-
Libellula fulva	Sivri lekelisubakiresi		LC	-	-	-	-
Crocothemis erythraea		Common scarlet	LC	-	-	-	-
Orthetrum albistylum		White-tailed skimmer	-	-	-	-	-
Orthetrum coerulescens		Keeled skimmer	-	-	-	-	-
Sympetrum fonscolombii	İlkbahartaşbakiresi	Red-veined darter or nomad	-	-	-	-	-
Sympetrum sanguineum	Siyah ayaklıtaşyusufçuğu	Ruddy darter	-	-	-	-	-
Sympetrum striolatum	Büyük taşbakiresi	Common darter	-	-	-	-	-
Gomphidae			-	-	-	-	-
Onychogomphus forcipatus		Small pincertail	-	-	-	-	-
ISOPTERA							
Calopterygidae							-

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Calopteryx splendens		Banded demoiselle	-	-	-	-	-
Coenagrionidae							-
Erythromma viridulum		Small Red-eyed Damselfly	-	-	-	-	-
Coenagrion puella	At nalıdesenliyusufçuk	The azure damselfly	-	-	-	-	-
Lestidae							
Lestes barbarus	Barbar sazyusufçuğu	Southern emerald damselfly	-	-	-	-	-
Lestes dryas		Scarce emerald damselfly	-	-	-	-	-
Lestes macrostigma		Dark Emerald Damselfly	-	-	-	-	-
Platycnemididae							
Platycnemis pennipes		White-legged damselfly	-	-	-	-	-



Figure 3. Photographs of some Odonat species determined in study area. a. *Lestes barbarus*, b. *Lestes dryas*, c. *Sympetrum sanguineum*, d. *Libellula fulva*, e. *Libellula depressa*, f. *Crocothemis erythraea*, g. *Aeshna isoceles*, h. *Coenagrion puella*. (@ Sözen).

Table 3. Hymenoptera (HYMENOPTERA) Species Detected at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
HYMENOPTERA							
Apoidae							
Apis mellifera	Balarısı	Honeybee	-	-	-	-	-
Xylocopa violacea	Marangoz arı	Carpenter bee	-	-	-	-	-
Bombus terrestris	Bombus arısı	Bumble bee	-	-	-	-	-
Vespidae							
Vespa orientalis	Eşekarısı	Hornet	-	-	-	-	-
Vespula vulgaris	Sarıcaarı	Wasp	-	-	-	-	-

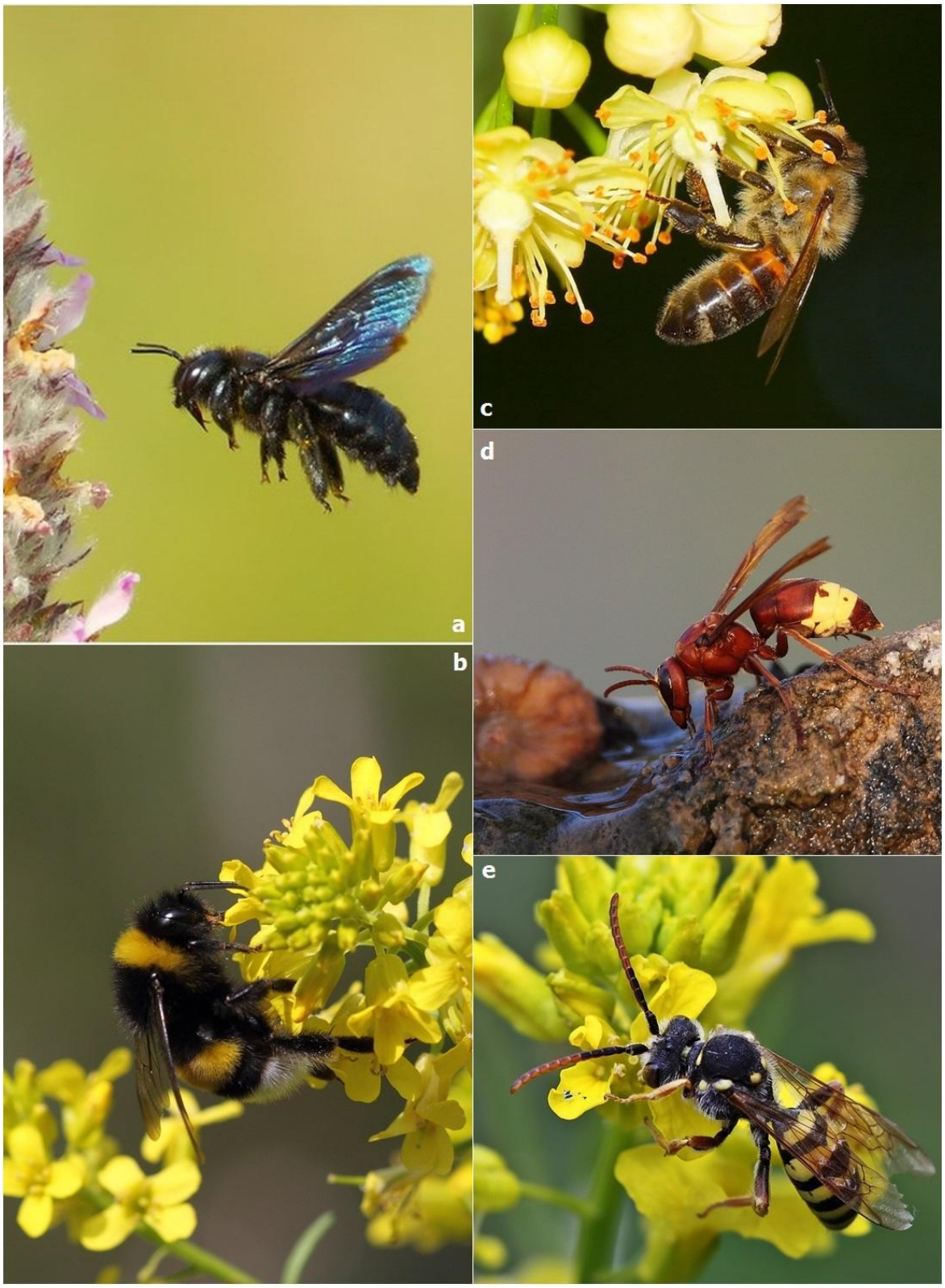


Figure 4. Photographs of some Hymenoptera species determined in study area. a. *Xyclopoda violocea*, b. *Bombus terrestris*, c. *Vespa orientalis*, d. *Apis mellifera*, e. *Polistes nimpha*. (@ Sözen).

Table 4.MANTODEA Species Detected at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
MANTODEA							
Mantidae							
Mantis religiosa	Peygamberdevesi	Praying mantis	-	-	-	-	-
Empusidae							
Empusa fasciata	Peygamberdevesi	Praying mantis	-	-	-	-	-



Figure 5. Photographs of some Mantodea species determined in study area. a.*Empusa fasciata*, b.*Mantis religiosa* (@ Sözen).

Table 5. Coleoptera Species Detected at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
COLEOPTERA							
Coccinellidae							
Coccinella semptumpunctata	Uğur böceği	Seven spotted lady bug	-	-	-	-	-
Exochomus quadripustulatus	-	Pine Ladybird					
Cantharidae							
Cantharis livida	-	Gardensafari Soldier Beetle					
Carabidae							
Cicindela campestris		Green Tiger Beetle					
Carabus chevrolati							
Chrysomelidae							
Chrysolina herbacea							
Lilioceris faldermanni							
Calomicrus circumfusus							
Cerambycidae							
Anastrangalia dubia							
Acanthocinusa edilis							
Cerambyx cerdo	Teke böceği						
Clytus rhamni							

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Morimus asper							
Rosalia alpina							
Prionus coriarius							
Buprestidae							
Buprestis octoguttata							
Meloidae							
Oenascras sicornis							
Mylabris variabilis							
Curculionidae							
Larinus sturnus							
Melyridae							
Anthocomus rufus							
Lycidae							
Lygistopterus sanguineus							
Silphidae							
Nicrophorus vespilloides							
Scarabaeidae							
Oryctes nasicornis							
Oedemeridae							
Oedemera brevipennis							

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Oedemera femorata							
Oedemera flavipes							



Figure 6. Photographs of some Coleoptera species determined in study area. a. *Larinus sturnus,* b. *Cicindela campestris*, c. *Cerambyx cerdo,* d. *Chrysolina herbacea*, e. *Oryctes nasicornis*. (@ Sözen).

Table 6. Diptera Species Detected at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
DIPTERA							
Muscidae							
Musca domestica	Karasinek	Housefly	-	-	-	-	-
Culicidae							
Culex pipiens	Sivrisinek	Mosquito	-	-	-	-	-

Table 7. Dermaptera Species Detected at the Study Area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
DERMAPTERA							
Forficulidae							
Forficula auriculari	Kulağakaçan	Earwig	-	-	-	-	-

Table 8. Orthoptera species detected at the study area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
ORTHOPTERA							
Grillidae							
Gryllus campestris	Cırcırböceği	Criket	-	-	-	-	-

Table 9. Hemiptera species detected at the study area

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
HEMIPTERA							
Grillidae							
Gryllus campestris	Cırcırböceği	Criket	-	-	-	-	-
Ricaniidae							
Ricania japonica							
Pentatomidae							
Piezodorus lituratus							

ORDER & Familia & *Species* (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	MAK	Endemism
Palomena prasina							
Eurydema oleracea							
Carpocoris mediterraneus							
Miridae							
Adelphocoris vandalicus							
Coreidae							
Gonocerus acuteangulatus							
Acanthosomatidae							
Acanthosoma haemorrhoidale							
Cicadidae							
Cicada orni	Ağustos böceği	Cicada					



Figure 7. Photographs of some Hemiptera species determined in study area. a. *Carpocoris mediterraneus*, b. *Cicada* sp., c. *Cicada orni*, d. *Gonocerus acuteangulatus*, e.*Erydema oleracea*. (@ Sözen).

According to **Table 10** below, among 150 invertebrate species determined 102 of them LCand 1 is NT by IUCN. According to National Red List (NRL) two of the Lepidoptera two species determined as close to endemic (EY) and 82 of them are LC.

Table 10. Summary of major invertebrate groups.

	Species number	IUCN					BERN App.	NRL		CITES App.		
		LC	VU	NT	NE	DD	I-II-II	EY	LC	I	II	III
LEPIDOPTERA	84	83	-	1	-	-	-	2	82	-	-	-
ODONATA	19	19	-	-	-	-	-	-	-	-	-	-
HYMENOPTERA	5	-	-	-	-	-	-	-	-	-	-	-
MANTODEA	2	-	-	-	-	-	-	-	-	-	-	-
COLEOPTERA	26	-	-	-	-	-	-	-	-	-	-	-
DIPTERA	2	-	-	-	-	-	-	-	-	-	-	-
DERMAPTERA	1	-	-	-	-	-	-	-	-	-	-	-
ORTHOPTERA	1	-	-	-	-	-	-	-	-	-	-	-
HEMIPTERA	10	-	-	-	-	-	-	-	-	-	-	-
Total	150	102	-	1	-	-	-	2	82	-	-	-

CONCLUSIONS

Invertebrates make up about 80% of the world's animal species. Invertebrates are also a highly diverse group, studied under 30 orders. In addition, the study of each group requires a separate expertise. Therefore, the area has focused on Lepidoptera and Odonata, and records have also been provided for some other groups. The project site has niches suitable for many different habitat types and many invertebrate species. Species diversity increases, especially in lands and clearings in forests, and invertebrate diversity decreases in plantation areas where vegetation has been changed.

In order to maintain and develop the biological diversity of the region, the most important practice is to carry out afforestation works suitable for the natural vegetation of the region and to protect the natural forest structure in the region. Especially as explained in the pollination section, plant pollination depends not only on honeybees but also on all insect groups. However, honeybees are the most focused and most contributing to the ecosystem as pollination function. Although other insects are few, they also contribute to the ecosystem and therefore it is extremely important to protect them.

REFERENCES

Dijkstra, K.-D.B. and Lewington, R., 2006, Field guide to the Dragonflies of Britain and Europe, Gillingham: British Wildlife Publishing, 320 pp.

Ambarlı, D. ve Karakaş Ö. B. 2011. *Kelebek kaçakçılığıilemücadelekılavuzu.* DoğaKorumaMerkezi, Ankara. Nisan 2001, ANKARA. Erişim: [www.dkm.org.tr]

Baytaş, A. 2007. *A Field Guide to the Butterflies of Turkey.* NTV Yayınları, İstanbul.

Baytaş, A., 2008, Türkiye'ninKelebekleri / DoğaRehberi, NTV Yayınları, İstanbul, 220 s.

Baytaş, A. ve E. Karaçetin. 2008. *Türkiye'nin Kelebek Rehberi*. DoğaDerneği, Ankara.

Karaçetin, E. ve H.J. Welch. 2011a. *Türkiye'deki Kelebeklerin Kırmızı Kitabı*. Doğa Koruma Merkezi, Ankara. Erişim: [www.dkm.org.tr]

Karaçetin, E. and H.J. Welch. 2011b. *Red Book of Butterflies in Turkey*. Doğa Koruma Merkezi, Ankara. Available online: [www.dkm.org.tr]

Karaçetin, E., H.J. Welch, A. Turak, Ö. Balkız ve G. Welch. 2011. 36 Türkiye'deki Kelebeklerin Koruma Stratejisi. Ankara: Doğa Koruma Merkezi. Erişim: [www.dkm.org.tr]

Koçak A. Ö. and Kamal M. 2009. Revised checklist of the Lepidoptera of Turkey. Priamus: Serial Publication of the Centre for Entomological Studies Ankara. Supplement. 17: 1 – 253.

Koçak A. Ö. and Kamal M. 2011. A synonymical, and distributional checklist of the Papilionidae and Hesperioidae of East Mediterranean countries, including Turkey (Lepidoptera). Priamus: Serial Publication of the Centre for Entomological Studies Ankara. Supplement. 25: 1 – 163.

Sözen, M. 2011. "Kelebekler: DoğanınSessizKanatları", *Seyahatname: Aylık Kültür ve Turizm Dergisi, Sayı 2*: 16– 34. Aralık 2011.

Sözen, M., Taşçı, E. ve Tozsin, T. 2012. Batı Karadeniz Bölgesindeki Bolu, Düzce, Zonguldak, Bartın, Karabük, Kastamonu ve Sinop İlleri Kelebek (Lepidoptera) Türleri. TC Orman ve Su İşleri Bakanlığı, Doğa Koruma ve Milli Parklar Genel Müdürlüğü, BiyoçeşitlilikSempozyumu, 22-23 Mayıs 2012, Ramada Plaza Otel, ANKARA.

URL 1: http://www.nhm.ac.uk/research-curation/research/projects/butmoth/

URL 2: http://www.adamerkelebek.org/ (Access: 3 June 2023)

URL3: http://kelebek-turk.com/ (Access: 5 June 2023)

URL 4: http://www.butterflies-moths-turkey.com/ (Access: 5 June 2023)

URL 5: http://www.dkm.org.tr/ (Access: 3 June 2023)

URL 6: http://www.trakel.org/ (Access: 3 June 2023)

ANNEX 8. LIMNOLOGICAL FIELD STUDIES ON SARIKUM LAKE AND SPECTROSCOPY RESULTS

FIELD STUDIES ON SARIKUM LAKE

Water Quality and Pollution

According to the working schedule, the team conducted field sampling. During the field sampling, general physical parameters water temperature, dissolved oxygen concentration, electrical conductivity, salinity, total dissolved solids, and pH were measured by using YSI Plus multiprob in Sarıkum Lagoon (**Figure 1**; **Table 2**). According to the bathymetric survey of the lake by using depth meter, the maximum depth was found 1.2m (**Figure 2**). From the sampling points, water samples were taken for the nutrient analyses to evaluate the current trophic state of the Sarıkum Lagoon.



Figure 1. Measurement of Physical Parameters (@Bilgin, 2023)

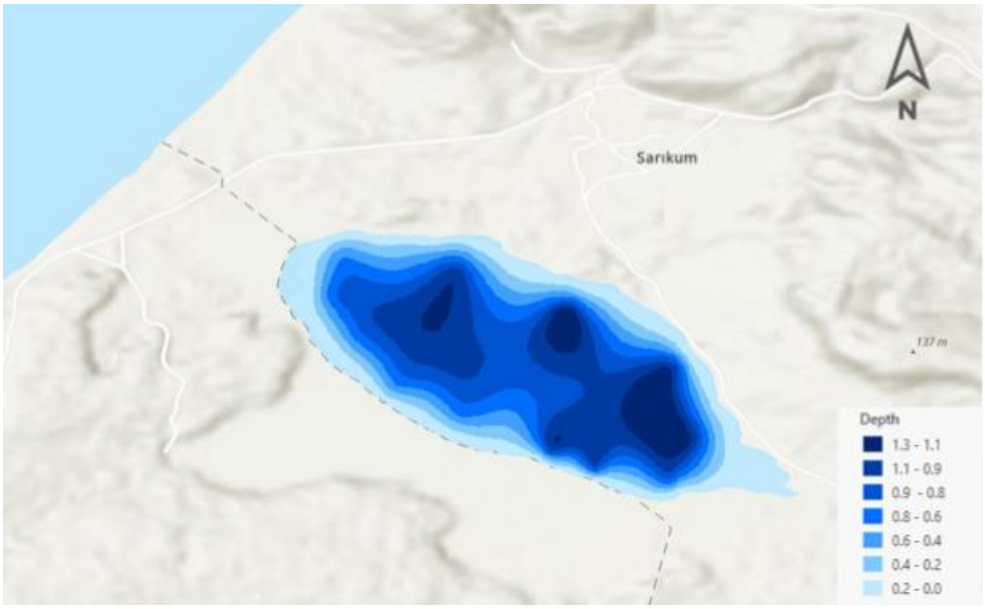


Figure 2. Batimetric map of Sarıkum Lagoon.

To understand the trophic state of a lake, Carlson Trophic State (TSI) is widely used methods in the literature.

The Index is a measure used to assess the primary production or nutrient level of a water body particularly freshwater lakes and reservoirs. Although, the index gives indirect estimation of eutrophic status of lakes, it is considered as a power tool for the various ecological studies and monitoring programmes (Klippel et al., 2020). The index helps classify the lakes into different categories based on their nutrient levels and primary productivity. According to the data obtained from the field work, the electrical conductivity and salinity is high reflecting the sea water intrusion into the lake (**Table 1**).

Table 1. General physical- chemical parameters of Lake Sarikum

Parameters	Values
Temperature (°C)	7.5
DO (%)	62,1
DO (mgL^{-1})	7,07
EC (μScm^{-1})	8958
TDS (mgL^{-1})	5542

Salinity (‰)	4.72
pH	8.22
PO4 (mgL^{-1})	0,01
SRP (μL^{-1})	8,67
TP (μL^{-1})	65,33
TN (mgL^{-1})	0,70
NO_3(mgL^{-1})	0,32
NH_4(mgL^{-1})	0,19

The index is relatively simple to calculate and according to the equation that we used in the report was based on the total phosphorus, TSI (TP), Lake Sarikum can be considered as Eutrophic (**Table 2**).

The simplified equation was:

$$TSI\ (TP) = 14.42.\ \ln(TP) + 4.15 = 64.41$$

This value shows that the lake has significant eutrophication (Table 2) and needs restoration.

Eutrophication is a process of excessive enrichment of nutrients, particularly phosphorus and nitrogen. There nutrients can be originated from various sources such as agricultural surface runoff, wastewater from domestic and industry. When the nutrients enter the water body, they stimulate the excessive growth of algae and aquatic plants causing negative effects on the aquatic ecosystems. The dense algea and macrophyte on the surface water lower the sunlight and disrupt the growth. Thereby, the decomposition process influences the oxygen level in the water.

If the consumption of oxygen level is high, these conditions can lead serious impacts including fish kills in the lakes. Considering the Sarikum Lagoon, the high level of nutrient would be related to the agricultural runoff, touristic activities however further research and periodic monitoring is needed before implementing the best practices.

Table 2. The trophic state of Sarikum Lagoon

TSI	TP (µ L (SHOULD BE -1 TO THE POWER))	Classification	Attribute
<30	<6	Oligotrophic	Clear water, oxygen throught the year in the Hypolimnion
30-40	6-12	Oligotrophic	Hypolimniaof the shallower lakes ay became anoxic
40-50	12-24	Mesotrophic	Water moderately clear; increase probility of hypolimnetic anoxia during summer
50-60	24-48	Eutrophic	Anoxic hyplimni, macrophyte problems possible
60-70	48-96	Eutrophic	Blue-green algae dominate, low transparency
70-80	96-192	Hypereutrophic	Light limited, dense algae
>80	192-384	Hypereutrophic	Algal scums, few macrophyte

According to the Surface Water Quality Management Regulation in Türkiye, which establish criteria and standards for various water quality parameters including levels of pollutants, nutrient and other factors that may impact the aquatic life, Sarikum Lagoon can be classified as “III Class” (see: official gazette no.29327). The classification indicates the water that can be used for aquaculture purposes after appropriate treatments excluding the usage in food and textile. The fact that there is no “blue flag sites” in the area where the lagoon is directly connected indicates that

the beaches in the area do not meet the criteria set by Blue Flag program for environmental and water quality standards. The absence of blue flag sites typically indicates the presence of anthropogenic stressors such as pollution and unsustainable land uses (State of the Environment Report, 2021).

In recent years, plastic pollution appears to be one of the important problems in natural life. Unfortunately, the increase in the plastic pollution has showed an unprecedented trend worldwide. This pollution considered as an emergent contaminant recently due to their serious impacts on aquatic organisms directly through ingestion etc. or indirectly through changes to habitat.

Sarikum Lagoon and its surroundings are declared as a Natural Protected Area however, the area subjected to plastic litter accumulation through winds, waves, and currents (Öztekin and Bat, 2017).

In a recently published paper revealed that the averages litter density as ranging from 1.512 items/m^3 to 31.87 items/m^3 in the Sarikum beach where the lagoon connection was in between the sampling sites. Main detected items were single used plastics such as food packaging and containers, beverage cans. Additionally, domestic litters such as furniture parts, hangers, clothes, shoes etc. was also obtained from the study (Ozteki et al., 2019).

In the current project, the limnology team also detected litter in the Sarikum beach (**Figure 3**) which supports the previous findings by Oztekin et al. (2019). Thereby, although there was no task defined for the microplastics in the Sarikum Lagoon, the team took the microplastic samples with 300 µm mesh size Manta net during the field work (**Figure 4**). The visual characterization of the microplastics using stereomicroscope has continued and will be presented final report (**Figure 5**).



Figure 3. Microplastic sampling in Sarikum Lagoon (Photo: @Bilgin, 2023).



Figure 4. Visual classification of microplastic samples (Photo: @Tavşanoğlu, 2023).



Figure 5. Marine litters in Sarikum beach during the field study (Photo: @Tavşanoğlu, 2023).

Paleolimnology

At the deepest point of the lake, short core was taken for the paleolimnological investigations (**Figure 6**). During the field work, the core samples were sliced into 1 cm thick layers using a blade and keep them cool until the analysis (**Figure 7**).

The samples were proceeding at the Ankara University, Center for Earth Sciences Research and Application for the calculation of elements.

Accordingly, to monitor the past organic content and lake temperature from the past,the isotope analyses was conducted at the Middle East Technical University, Department of Geology. The detailed paleolimnological surveys will be presented in the final report due to the analyses has not completed yet. The stratigraphic representation of major and trace elements was given **Figures 8** and **9**.



Figure 6. Core sampling (@Yılmaz, 2023)



Figure 7. Slicing the core sample (@Bilgin, 2023)

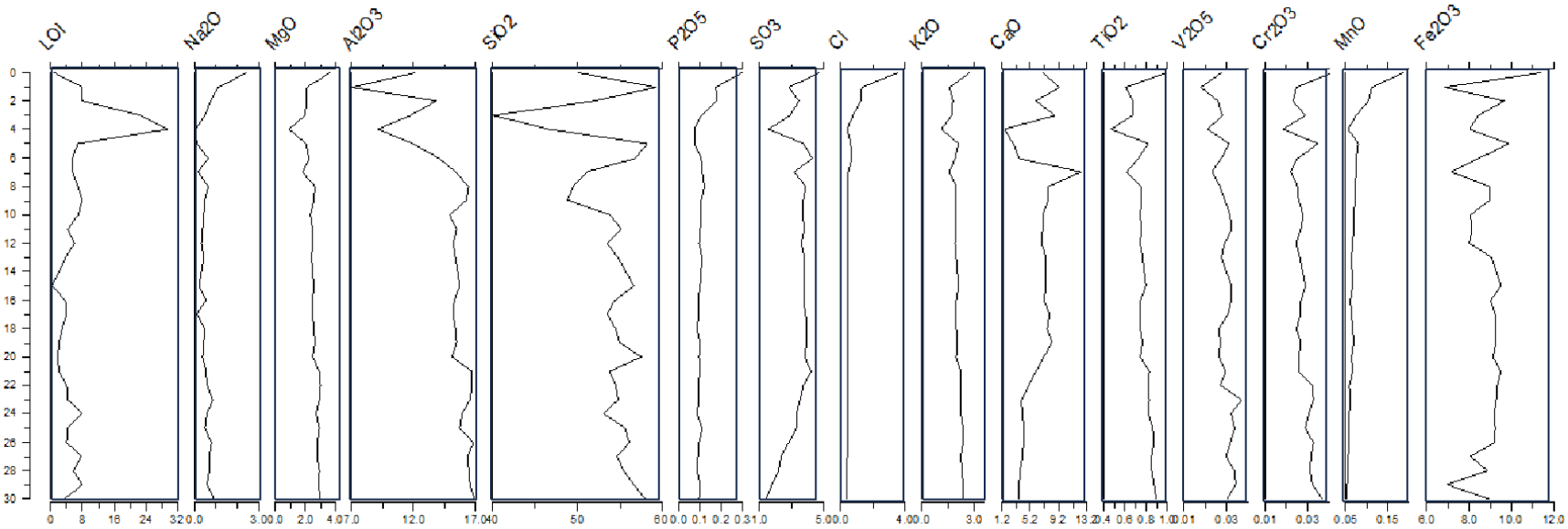


Figure 8. Major ions along the sediment core in Lake Sarikum. Please note y axis represents the depth of the core and x axis concentration in %.

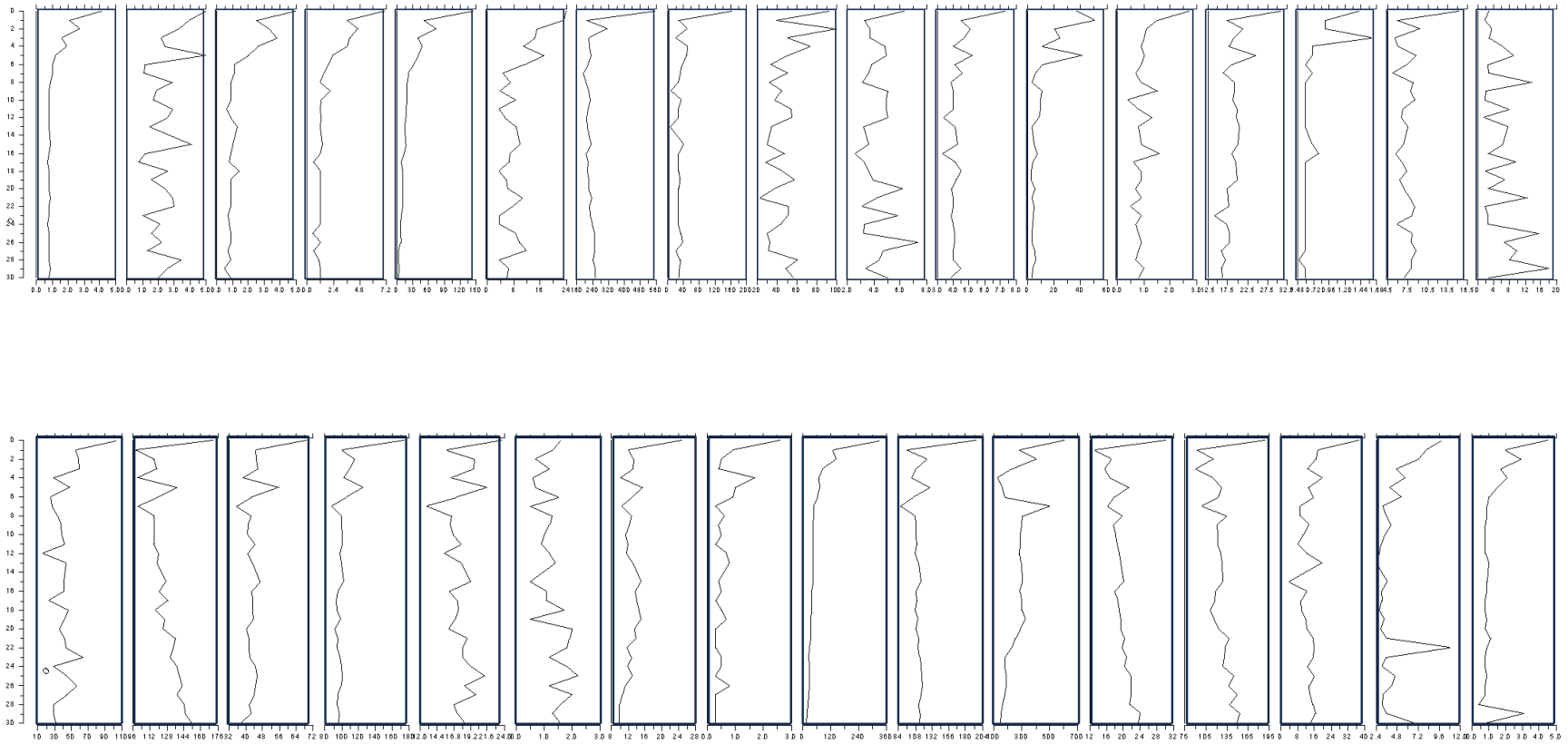


Figure 9. Trace elements along the sediment core in Sarikum Lagoon. Please note y axis represents the depth of the core and x axis concentration in ppm.

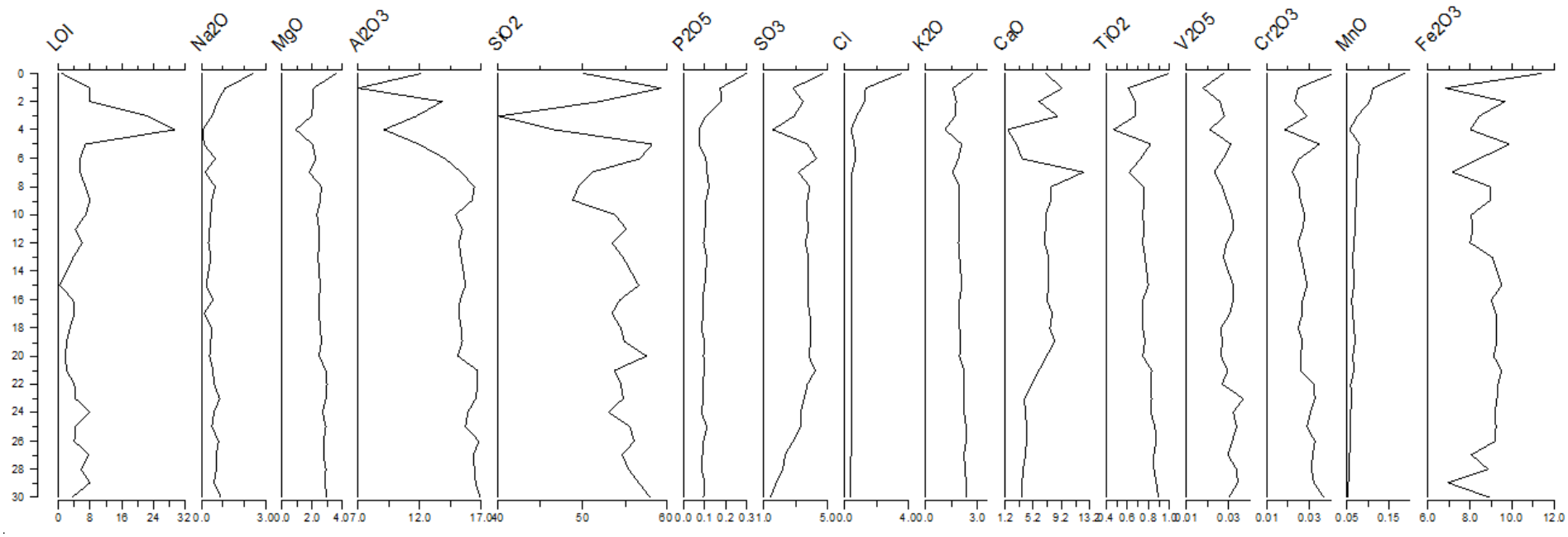
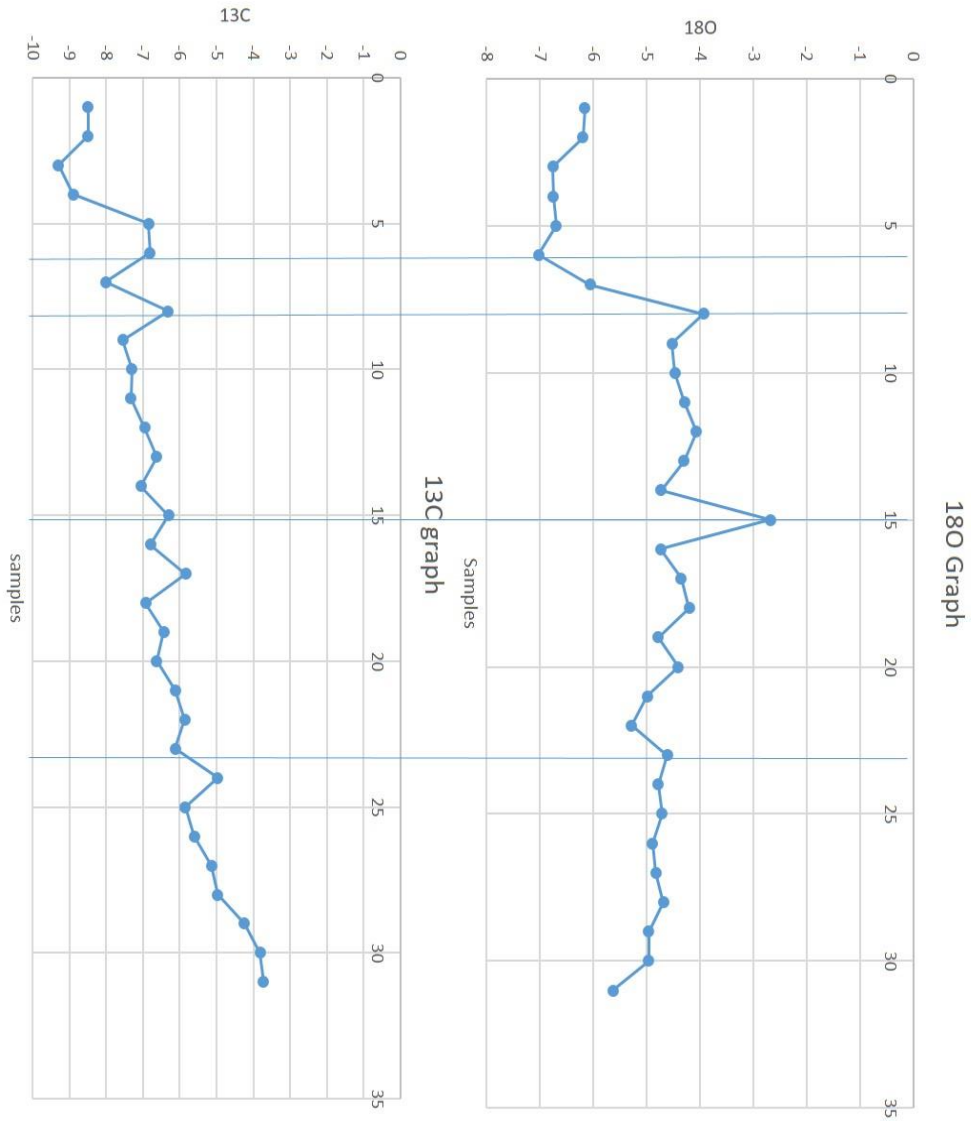


Figure 10. Inorganic Element Analysis



The chemical input, increase in vaporaziation/temperature and carbon sequestration/production, increase in nutritient input
Relatively colder and lower amount of nutritient input, less organic matter binding/ decrease in production, more surface content input, decrease in reductant conditions
Maximum point for relatively colder and lower amount of nutritient input, less organic matter binding/ decrease in production, more surface content input, decrease in reductant conditions
Relatively colder and lower amount of nutritient input, less organic matter binding/ decrease in production, more surface content input, decrease in reductant conditions
Relativelywarmerandlower amount of nutritient input, slightly increase in organic matter binding/ increase in production, much more surface content input, decrease in reductant conditions

Figure 11. Stable Isotope Analysis (13C and 18O)

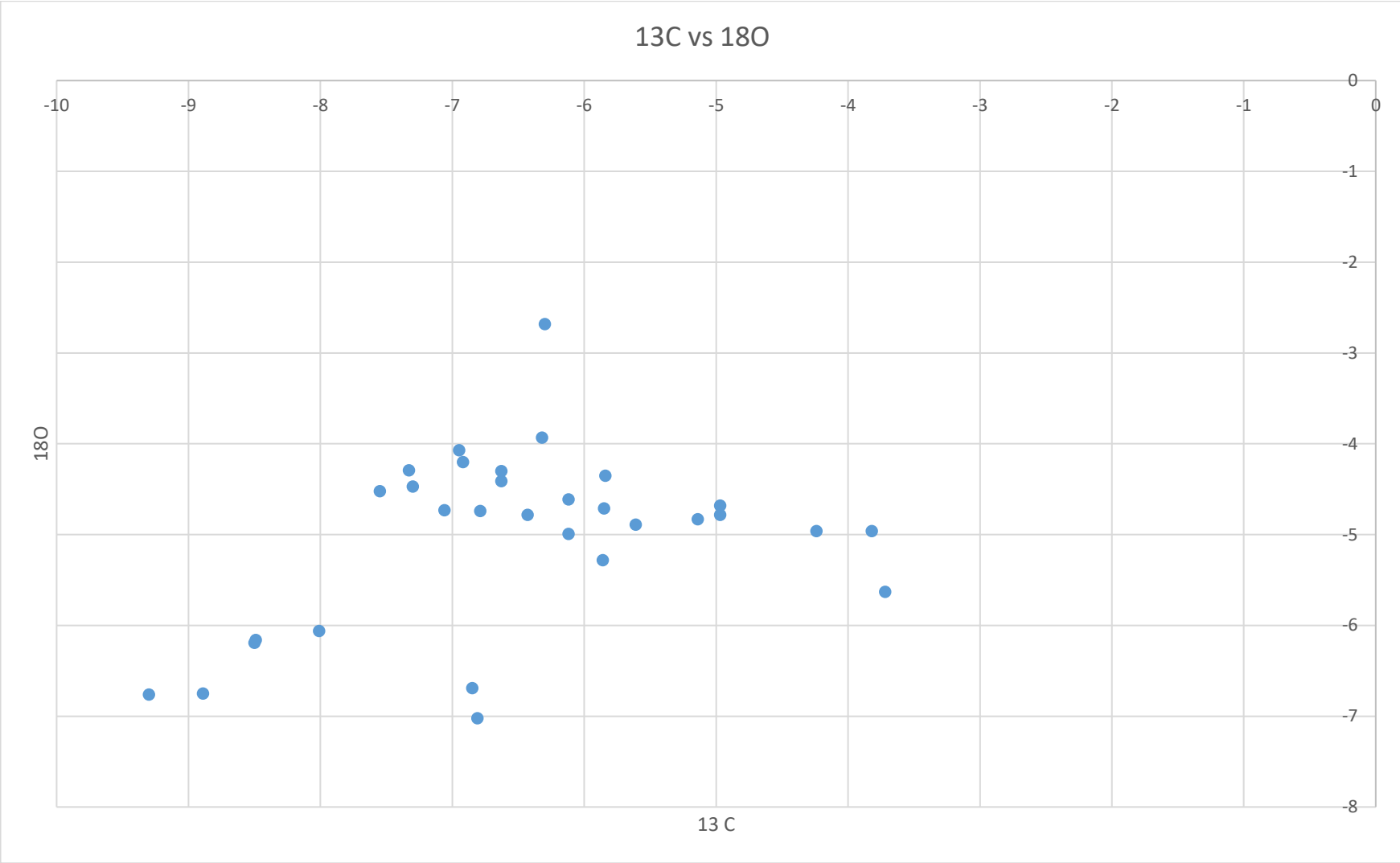


Table 12. Stable isotope comparison (13C vs 18O)

The chemistry of the lake is affected by rainfall, input of meteoric water, surface tempratures. It is also shown that both sea water and surface erosion/corrosion affects the chemistry of the lake.

When the stable isotope and element content of the core samples (samples from 1 to 31) collected from the surface to the depth (with 1-2 cm intervals in the column) is analyzed, it is shown that there are historical changes in the lake chemistry in the last centuries during the sedimentations such as ‘increase in vaporaziation/temperature and carbon sequestration/production, increase in nutritient input’ and ‘colder and lower amount of nutritient input, less organic matter binding/ decrease in production, more surface content input, decrease in reductant conditions’.

Analysis of the drilling clearly shows that there have been sequential changes in the chemical conditions of the lake throughout history, namely the chemistry, temperature, sedimentation and reductant conditions of the lake have been changed in the last centuries.

Further research is needed on aging the lake sediments with radiometric methods for exact sequencing of the changes in the last 1000 years. As of now it is proven that there are changes in tempratures and chemistry of the lake, implying a climate related change. In order to show the sea water connection, vaporization, wind carried sediments andsurface water carried sediments (clay, silt, sand and dissolved material), organic matter production can be sequencially ordered by further research.

REFERENCES

Gabriel Klippel, Rafael L. Macêdo, Christina W. C. Branco (2020). Comparison of different trophic state indices applied to tropical reservoirs. Lakes and Reservoirs, vol 25, Issue 2, 214-229.

State of the Environment Report, 2021. Sinop İli 2020 Yılı Çevre Durum Raporu, Çek ve Çevre izinleri Şube Müdürlüğü, pp.127.

Öztekin, A., Bat, L. (2017). Microlitter Pollution in Sea Water: A Preliminary Study from Sinop Sarikum Coast of the Southern Black Sea. Turkish Journal of Fisheries and

Aquatic Sciences, 17, 1431-1440.

https://dx.doi.org/10.4194/1303-2712-v17_6_37

ANNEX 9. FIELD STUDIES ON SOIL SCIENCE, SOIL CARBON AND NITROGEN ACCOUNTING

1. PROJECT AREA LOCATION

The research area is located in the Sarikum basin in the North of Sinop province in the Central Black Sea Region and is between 657000-661000 E and 4651000-4656000 N (36 ZoneUTM) coordinates. Sarıkum basin has a total area of 6773.7 ha and the study area constitutes 1178.7 ha in the basin (**Figure 1**).

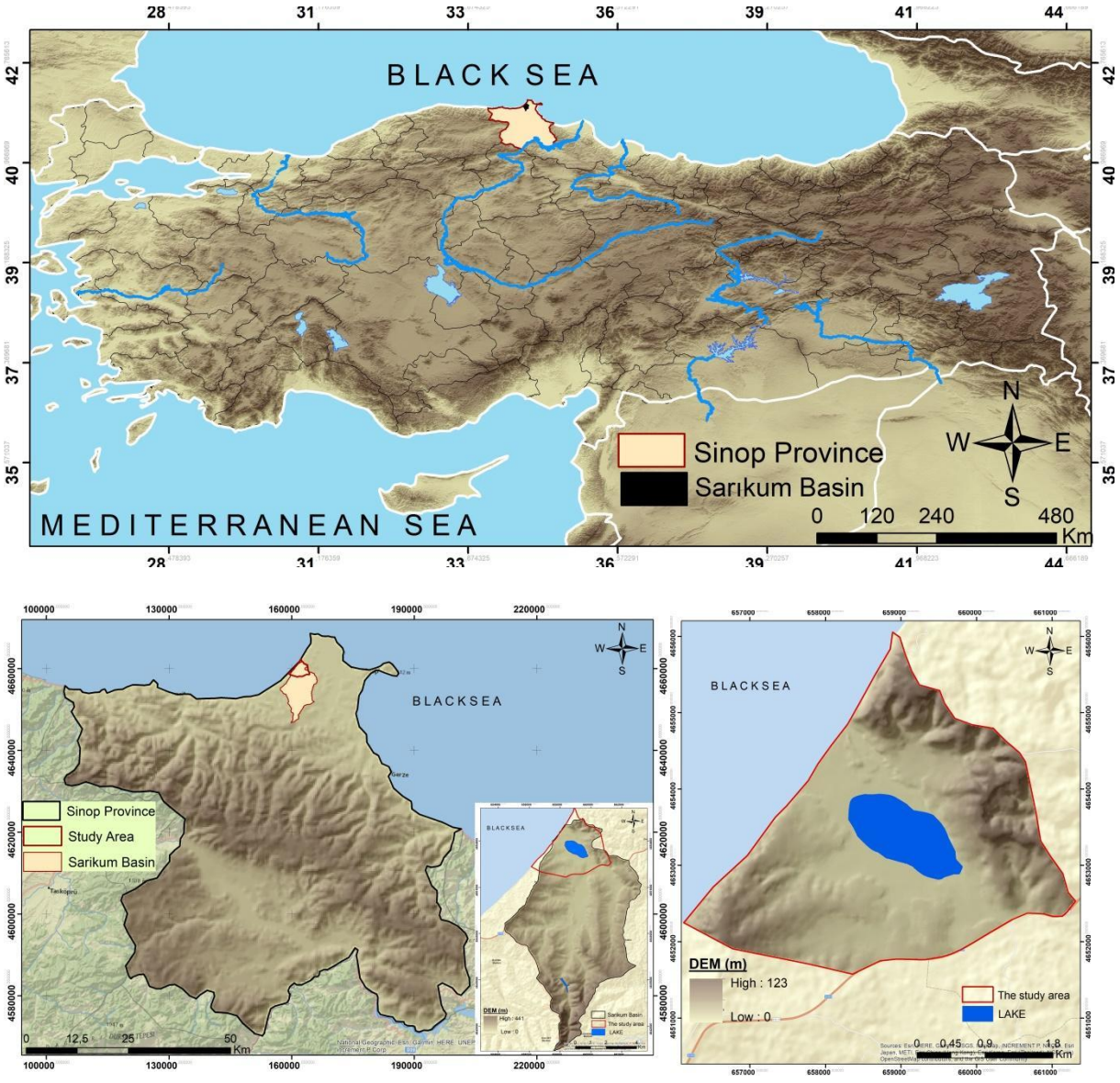


Figure 1. Location of the study area



Figure 2. National Park entrance

2. PROJECT AREA TOPOGRAPHIC FEATURES

According to the elevation and digital elevation model of the basin, it has an altitude varying between 0 and 440 m above sea level. The elevation increases especially from north to south (**Figure 3**). On the other hand, within the boundaries of the national park, the elevation has a maximum height of 123 m above sea level, and the altitude increases in the north-east and south-west parts of the area.

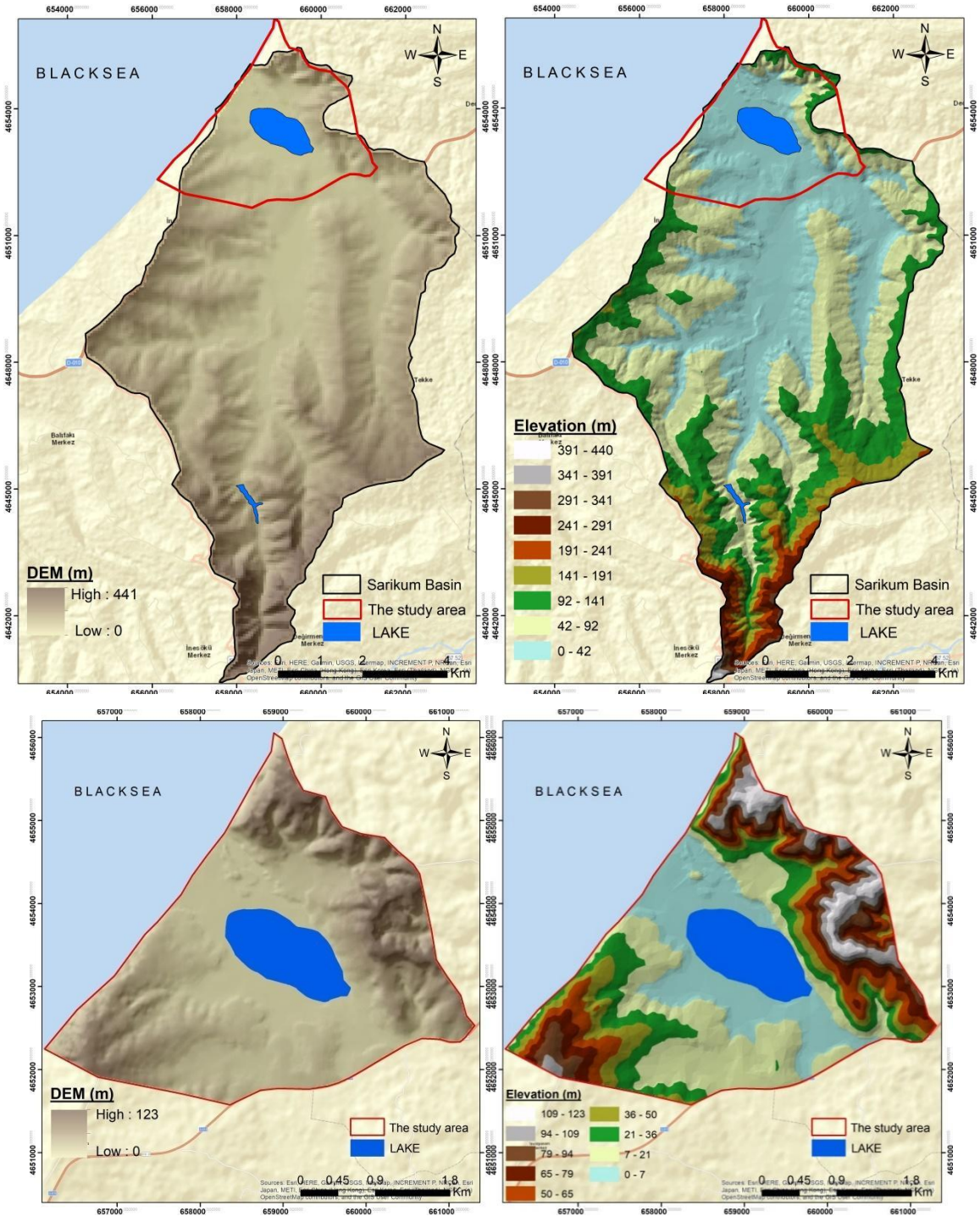


Figure 3. DEM and elevation maps of the Sarikum basin and the study area

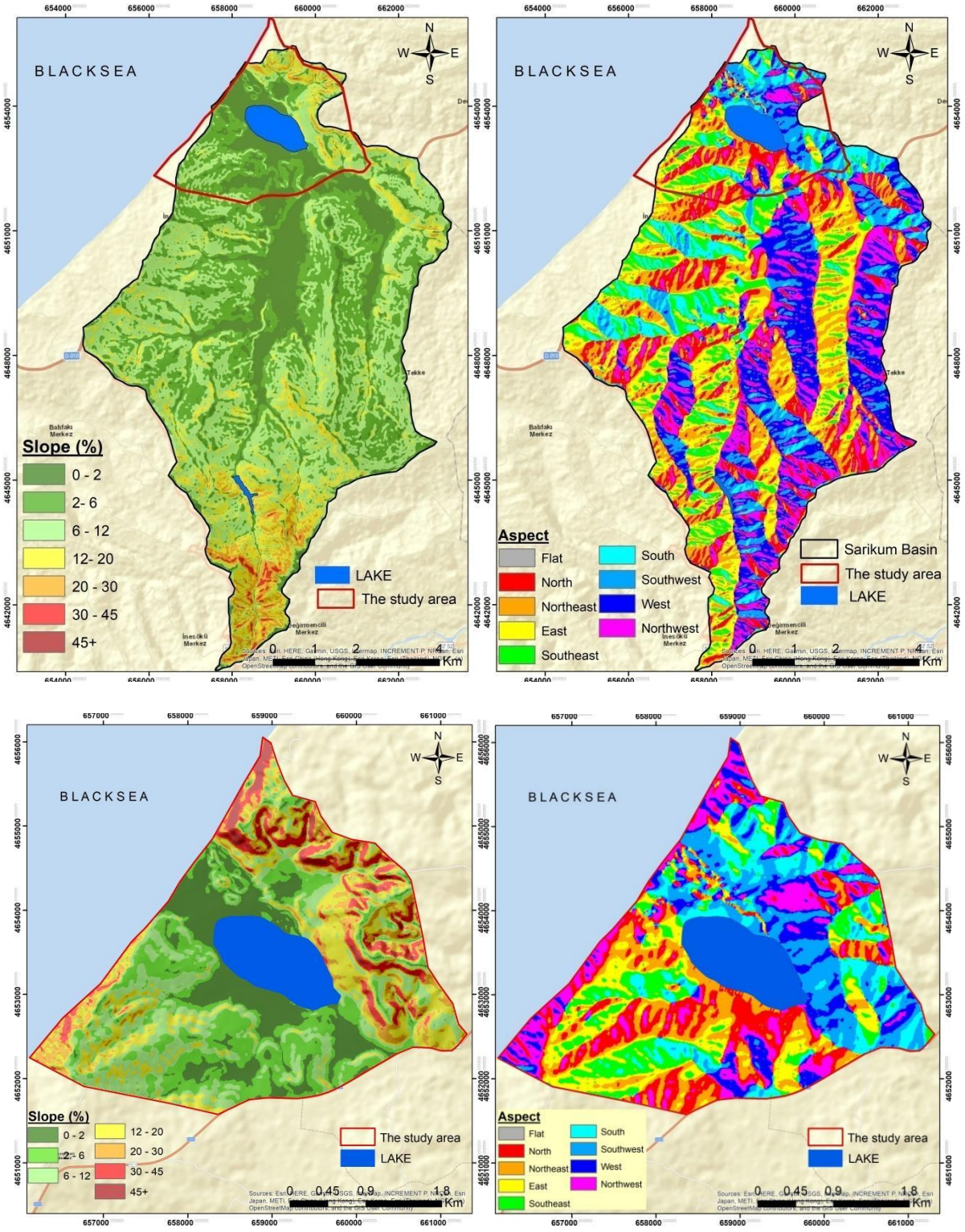


Figure 4. Slope and aspect maps of the Sarikum basin and the study area

The slope and aspect maps of the Sarikum basin are given in **Figure 5**. While 25.7% of the Sarikum basin area consists of flat and slightly sloping areas, nearly half of the total area (46.2%) consists of steep and steep slopes. The slope increases especially in the southern parts of the basin.

It is seen that the slopes are almost flat and mild in the southwestern parts of the area. In addition, although the general directional tendency of the basin is north-west and north-east, it is common in the south-east and south-west directions within the borders of the national park.

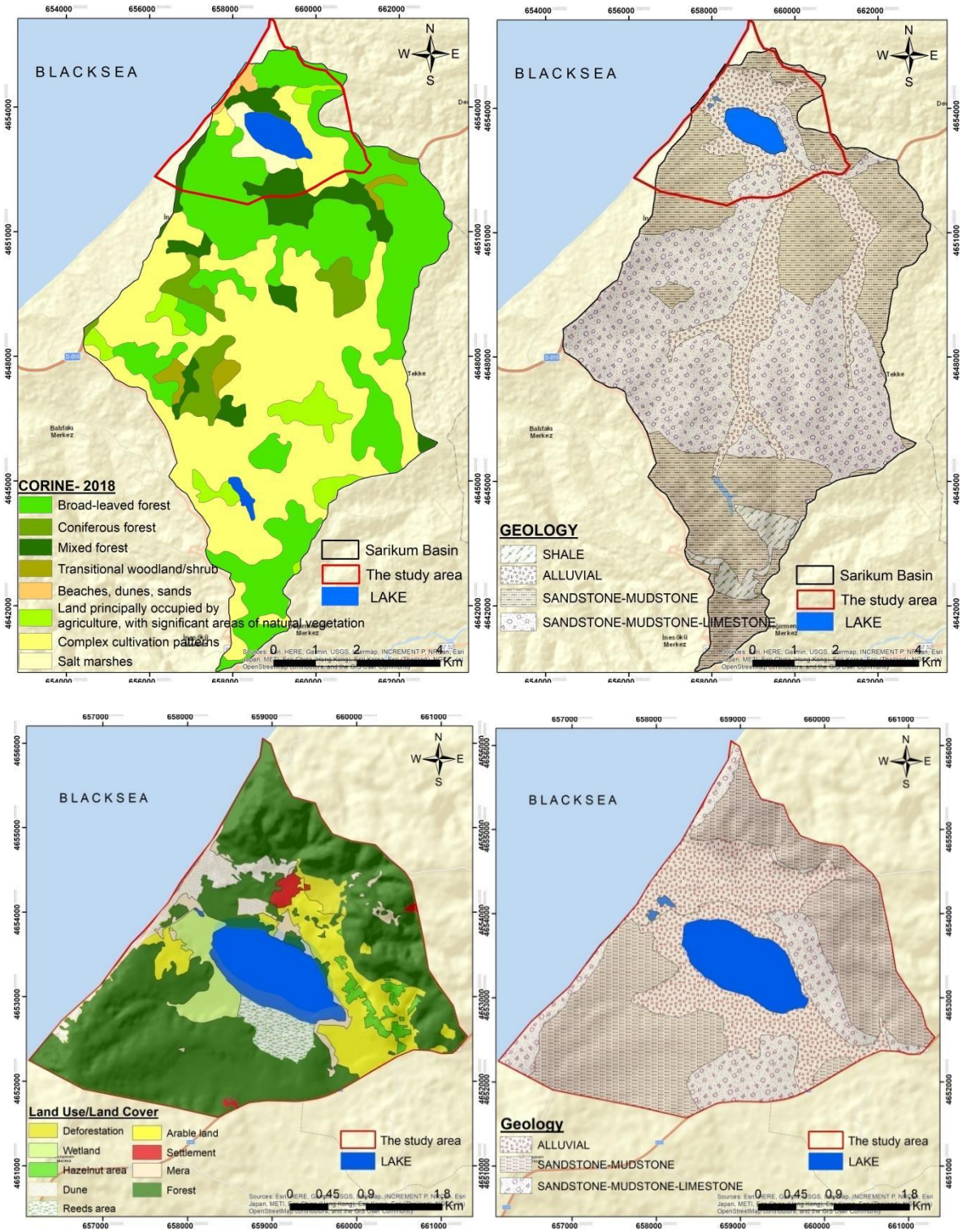


Figure 5. Land use-Land cover and geological maps of the Sarikum basin and the study area

According to the CORINE-2018 land use land cover classification, Complex cultivation patterns and forest lands are commonly seen in the basin.

Within the borders of the national park, after detailed land classifications made on a large scale, it was determined that besides the forest lands, settlement and agricultural lands are common in the north-eastern parts of the lake.

In terms of the geological features of the basin, sandstone-mudstone, limestone mixture and alluvial deposits are located in the middle parts of the basin, while sandstone and mudstone mixtures are located at the northern and southern ends of the basin. In addition, shale parent material is also distributed at the northern end of the basin. Within the borders of the national park, there are common alluvial deposits and mixtures of sandstone and mudstone.

3. PROJECT AREA EROSION AND HYDROLOGY FEATURES

The study area is located in the Batı Karadeniz large river basin. Micro-basins and waterways related to the basin in which the study area is located were determined with the help of hydrological analyzes (**Figure 5**). Soil loss due to water erosion in the basin Renard et al. (1997) with the help of the RUSLE model (Revised Universal Soil Loss Equation) (**Figure 6**). Soil losses are presented as ton ha $^{-1}$ year $^{-1}$ on this map created by using sub-model parameters of precipitation, soil, land use and topography.

In the southern parts of the basin, the erosion rate is high in marginal agricultural areas created as a result of slope factor and trenches from forest areas. It has been observed that soil losses are high due to the destruction of forest areas, especially in the eastern and northeastern parts of the national park border.

Most of the agricultural areas in the region are marginal agricultural areas opened from natural areas. In these agricultural areas, mainly fodder crops and hazelnuts are cultivated. As can be seen in **Table 1**, the highest soil losses occur in agricultural areas. Soil losses from forest areas are in the second place with 25.09%.

Most of the soil losses occurring in the Sarikum basin are in the acceptably very light and light classes (**Table 2**). In the moderate, severe and very severe classes, soil losses are 5.72%, 1.16% and 0.04%, respectively.

Table 1. Soil losses on the basis of land uses

Land Use Status	Erosion Amount (ton year $^{-1}$)	Unit Erosion Amount (ton ha $^{-1}$ year $^{-1}$)	Ratio in Total Erosion (%)
Forest	3,780.68	1.02	25.09
Agriculture	11,045.45	3.90	73.29
pasture	0.57	1.00	0.00
Other	244.35	1.01	1.62
Total	**15,071.05**	**2.23**	**100.00**

Table 2. Erosion classes and their percentage distributions

Erosion Severity Class ton ha $^{-1}$ year $^{-1}$)	Percentage (%)
Very Light (0 - 1 ton ha $^{-1}$year $^{-1}$)	75.18
Light (1.01 - 5 tons ha $^{-1)}$year^{-1})	17.91
Medium (5.01 - 10 tons ha $^{-1}$year $^{-1}$)	5.72
Severe (10.01 - 20 tons ha $^{-1}$year $^{-1}$)	1.16
Very Severe (> 20.01 tonsha^{-1}year $^{-1}$)	0.04

Erosion maps are evaluated in 5 classes by the General Directorate of Combating Desertification and Erosion (**Figure 5**). According to this classification, the average soil loss in the project area is below the value of 1 ton ha -1year -1. It is included in the very light erosion class.

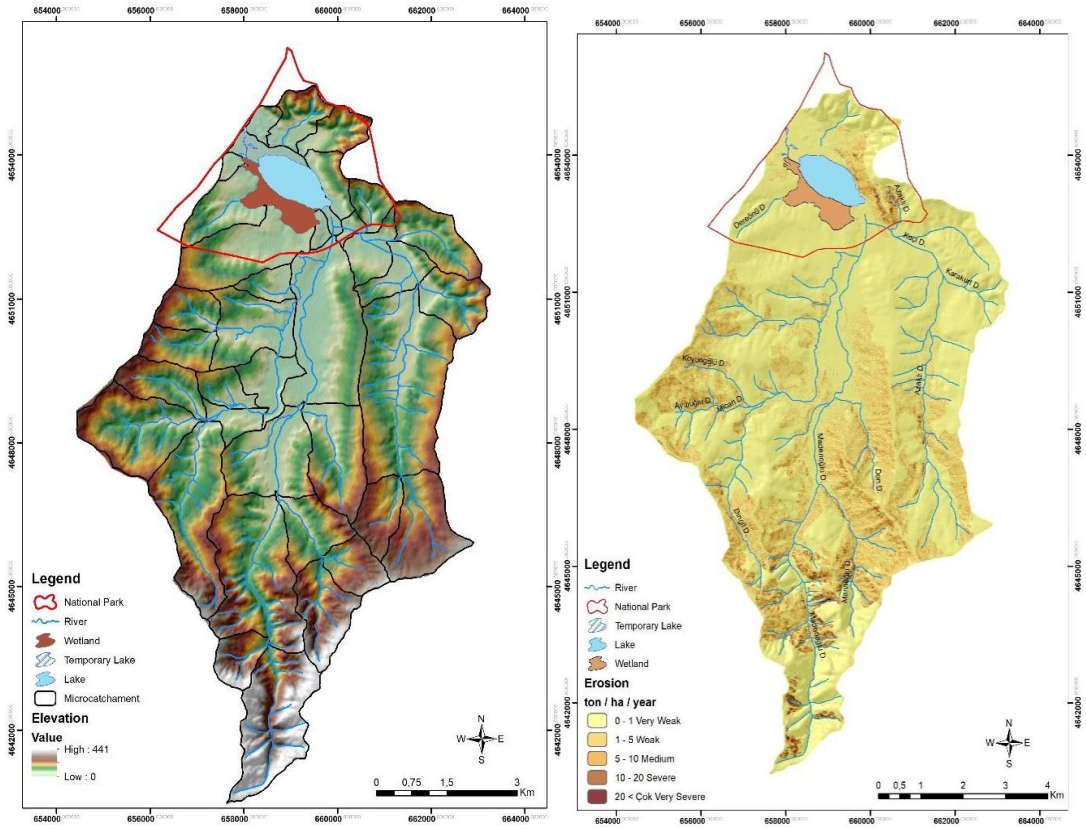


Figure 6. Hydrology and Erosion map of the Sarıkum basin and the study area

4. DESCRIPTION OF THE PROJECT AREA SOIL SERIES

A total of 11 soil series have been defined within the boundaries of the Sarıkum basin, and the series distribution map created is given in **Figure 7.** The areal and proportional distributions of each series are given in **Table 3.** According to **Table 3**, the soil series with the least distribution in the basin is the Incesökü series (3.7%), while the soil series with the highest distribution area are the Selbeyi and Incepınar soil series (16.8%).

Table 3. Distribution amounts and ratios of soil series within the study area

Series Name	**Symbol**	**Area (ha)**	**Ratio (%)**
Sarikum gölet	sg	413.3	6.1
Topçu köyü	to	769.9	11.4
Sarikum-3	Sk-3	416.4	6.2
İncesökü	Of	248.6	3.7
Incepınar	Rope	1133.9	16.8

Sarikum-2	Sk-2	339.5	5.0
Değirmencili	dg	839.5	12.5
Yukarıgölet	Yg	534.7	7.9
Selbeyi	sb	1127.6	16.8
Başaran	ba	448.8	6.7
Sarikum-1	Sk-1	347.8	5.2
Su yüzeyleri	-	111.1	1.7
Total	-	**6731.1**	**100.0**

Within the borders of the national park, Sarikum gölet series, Selbeyi series and Sarikum-1 series among these series have a widespread distribution area. Ince pınar series in the south-west end of the area and Topçu village series in the south have covers small area.

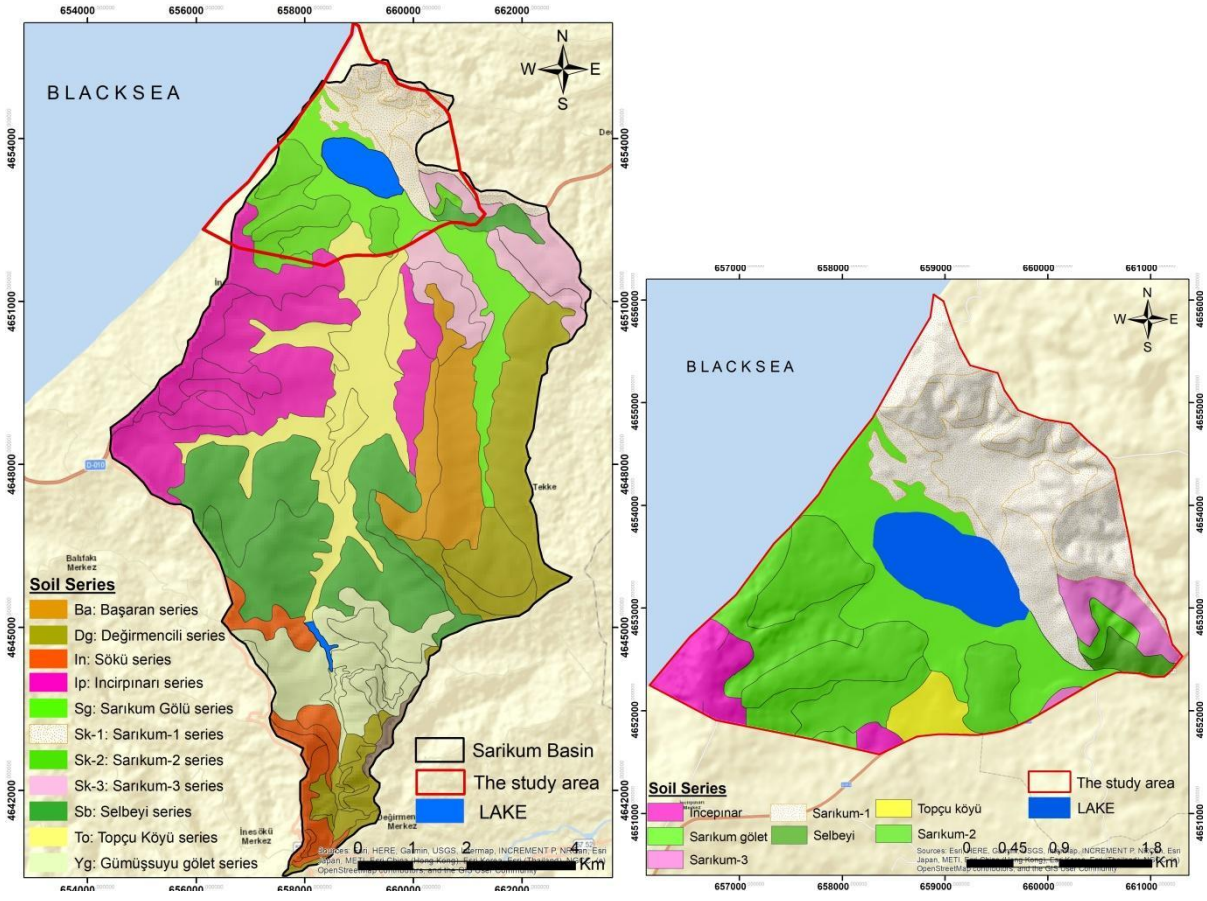


Figure 7. Soil maps of the Sarikum basin and the study area

5. SOIL SAMPLING AND ANALYSIS

Considering the differences in land cover and land use, 44 soil samples were taken from the study area (**Figure 8**).

In order to determine the physical and chemical properties of the soils taken, it is prepared for analysis after preliminary processes (rough parts and plant residues were removed, air-dried soils in laboratory conditions were beaten with a wooden mallet and sieved through a 2 mm sieve). The methods adopted in the physical and chemical study of soils were determined according to the methodologies in the literature shown in **Table 4.**

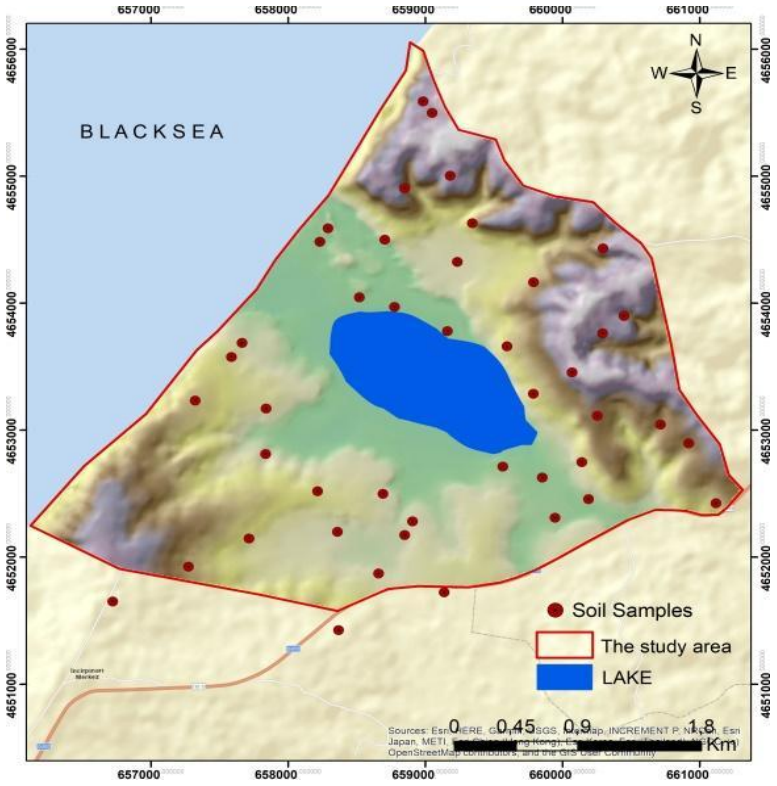


Figure 8. Soil sampling pattern in the study area

Table 4. Methods applied for the analysis of soil physical and chemical properties.

parameter	unit	procedures	Reference
Texture (clay, silt and sand)	%	Hydrometer method	Bouyoucos, 1951
pH	1:1	Soil-water suspension (w:v)	Soil Survey Staff, 1992
EC	dSm^{-1}	Soil-water suspension (w:v)	Soil Survey Staff, 1992
$CaCO_3$	%	calcimetric method	Soil Survey Staff, 1992
Organic Matter	%	Walkley-Black method	Nelson and Sommers, 1982
BD	gr cm^{-3}	Undisturbed condition	Blacke and Hartge, 1986

In determining the amount of organic carbon and nitrogen stored in tons per hectare, the determination was made using the following formula for 30 cm soil depth.

$$\text{SOC stock}=\frac{(1-\delta i\%)x\ \rho i\ x\ Ci\ x\ Ti}{100}$$

$$\text{N stock}=\frac{(1-\delta i\%)x\ \rho i\ x\ Ni\ x\ Ti}{100}$$

Where TOC: Soil organic carbon (ton ha-1), δi: amount of coarse fraction greater than 2 mm, ρi: bulk weight (g cm−3), Ci/Ni: organic carbon-nitrogen amount (%), Ti: depth of soil sample taken (cm). In addition, taking into account the soil series and the phases of the series, the depths were determined on the soil map and the total amount of stored organic carbon and nitrogen was calculated.

6. SOC-STOCK AND N-STOCK DISTRIBUTION

The distribution of soil organic carbon and nitrogen content in tons/ha, obtained from 44 surface soil samples taken by considering the land use and land cover differences in the National Park area located within the borders of Sarikum basin, is given in **Figure 9.**

According to the SOC-stock distribution map, the amount of soil organic carbon within the borders of the National Park shows a wide distribution between 0.5-ton C ha^{-1} and 118.7 tons C ha^{-1}. When this distribution is evaluated together with the soil map created before for the basin, it can be seen that the dunes, alluvial deposits, and Sk-1.5, Sk-1.6 mapping units belonging to the Sarikum-1 series formed on the sandstone-mudstone, which are distributed especially in the northeastern parts of the national park, and the distribution in the west of the area.

It was determined that soil organic carbon stocks were at low levels in the Sk-2.5 mapping units, which partially belong to the Sarikum-2 series, which were formed on sandstone-mudstone, sandstone-mudstone-limestone. On the other hand, it was determined that soil organic carbon stocks were at very high levels in the lands distributed in the southern parts of the national park (Sarikum gölü series, Topçu köyü series).

It is possible to say a similar distribution within the soil nitrogen stock distribution. According to the N-stock distribution map, the amount of soil nitrogen stock within the borders of the National Park shows a wide distribution between 0.66 tons N ha $^{-1}$ and 26.61 tons N ha $^{-1}$.

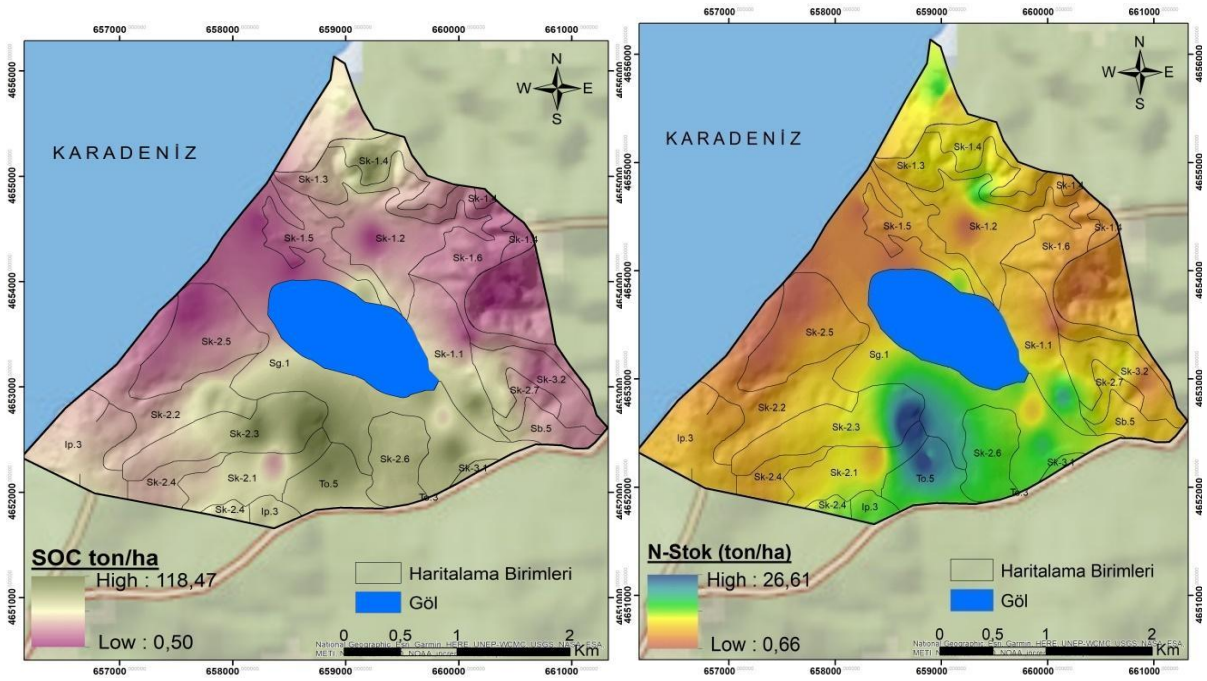


Figure 9. Distribution of SOC-stock and N-Stok maps of the study area

Distribution maps of soil organic carbon and nitrogen content in tons/ha considering the land use-land cover (LULC) change are given in **Figure 9.** It depends on the LULC pattern, which varies over a major source of soil organic carbon and nitrogen content of soils. Distribution maps of organic carbon and nitrogen content of soils with LULC show parallelism with each other.

Since most of the southern parts of the national park are covered with forest lands, both SOC stock (ton/ha) and N-stock (ton/ha) values show a very high distribution. It has been determined that there are significant decreases in soil organic carbon and nitrogen content due to the fact that the soils are very scarce in the sand dunes near the coast as well as the settlements and agricultural areas in the northeast.

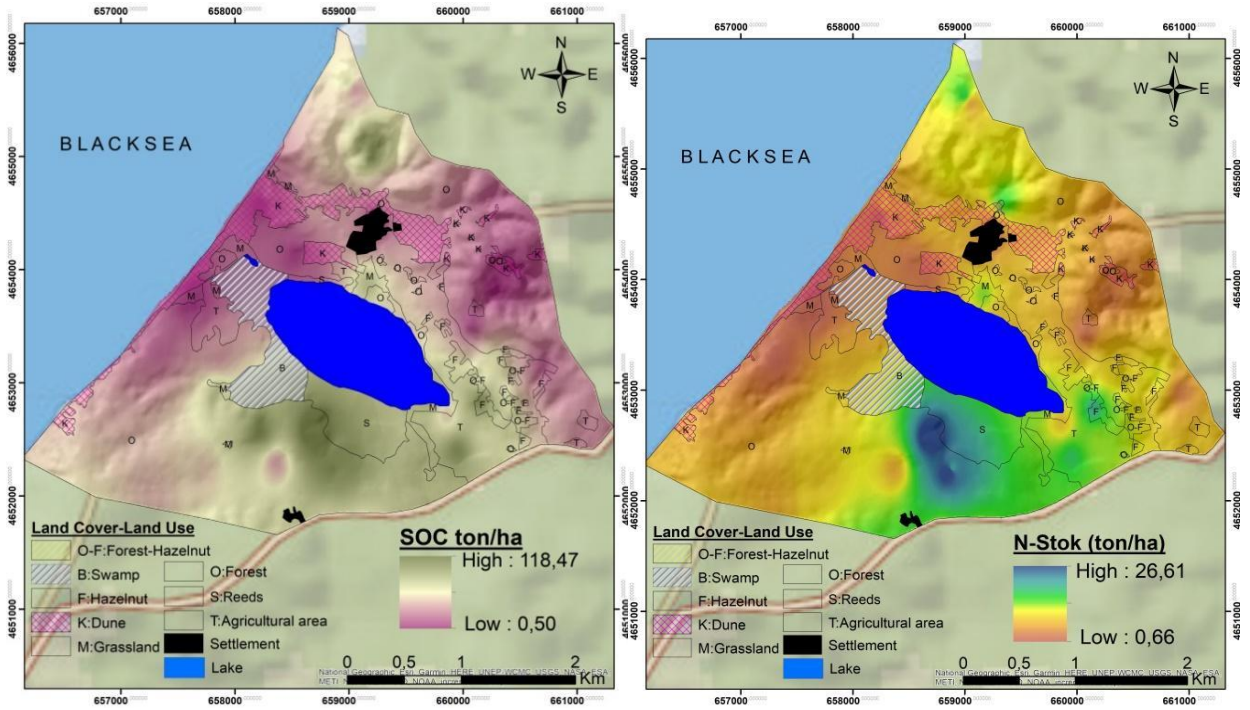


Figure 10. Distribution of SOC-stock and N-Stok maps with LULC of the study area

Soil organic carbon values are classified in 15 classes within the scope of the Türkiye Soil Organic Carbon project carried out by the General Directorate of Combating Desertification and Erosion. Considering this classification, an average of 48 tons of C ha -1 0-30cm-1 in the project area falls into the middle level SOC stock class.



Figure 11. General view of Sarikum Lake



Figure 12. View from reeds and marsh



Figure 13. View from pasture



Figure 14. View from agropastoral systems-1



Figure 15. View from agropastoral systems-2



Figure 16. View from dune afforestation



Figure 17. View from dune start point

The change of soil organic carbon and nitrogen content of soils depends on depth, soil maturity level (amount and type of horizontalization), texture and pedological and physico-chemical properties of soils as well as LULC pattern. In this context, the total soil organic carbon and nitrogen stock contents were determined by considering the phase characteristics (depth, bulk weight, organic matter content, etc.) of each series in the mapping units included in the soil map previously created for the Sarikum basin.

Distribution maps of soil organic carbon and nitrogen content in tons/ha, taking into account the change in total soil depth, are given in **Figure 18.** When the distribution of both the total soil organic carbon stock and the nitrogen stock values of the soils is examined within the borders of the national park, it is seen that the mapping units distributed in the south and south-west parts of the area are higher than the northern and north-eastern parts of the area. It can be said that it is due to the fact that it is deeper in the soils distributed especially in the south and south-west parts, and that the clays, which provide the retention of organic carbon, are at higher levels.

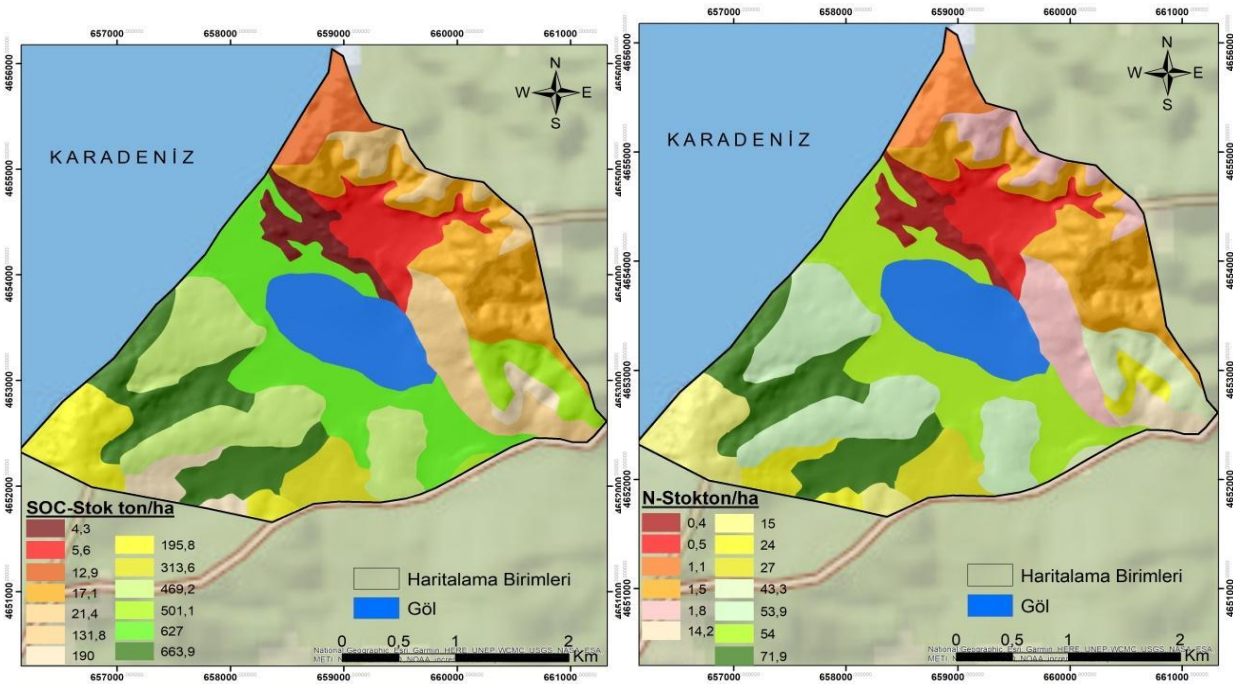


Figure 18. Distribution of total SOC-stock and total N-Stock maps of the study area

7. INFORMATION ON LAND DEGRADATION IN THE PROJECT AREA

The degradation caused by the land cover changes produced in the light of the data obtained from the CORINE Land Cover and Land Use projects carried out between 1990 and 2018 is presented in **Figure 19**.

The degradation due to land cover changes in the Sarıkum basin was determined as 107.88 ha (1.6%). Recovery was observed in 100.82 ha (1.5%) area, while stable areas were determined as 6474.33 ha (96.9%).

The fact that a part of the basin is a national park and the wide coverage of forest areas has been effective in protecting it from degradation.

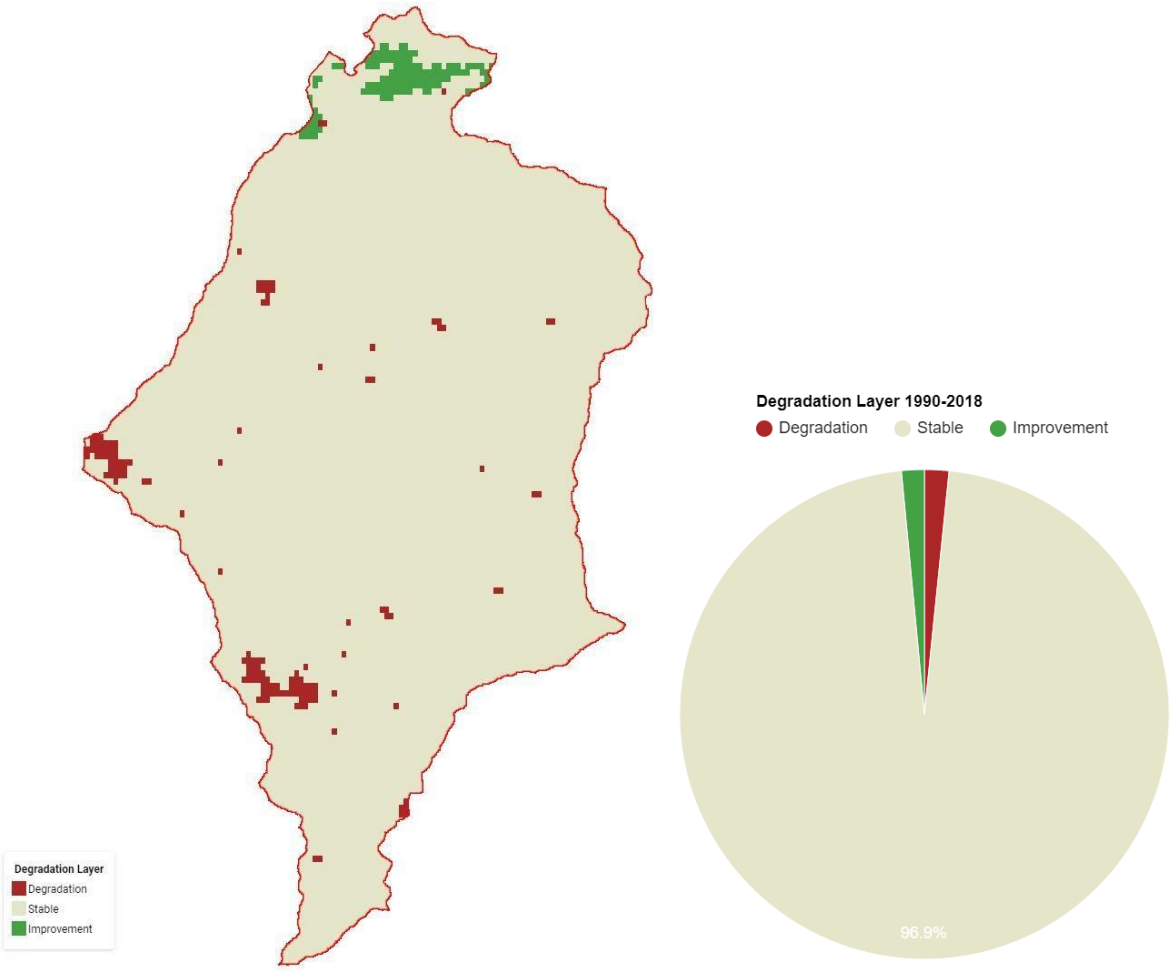


Figure 19. Deterioration on the basis of land cover between 1990 and 2000

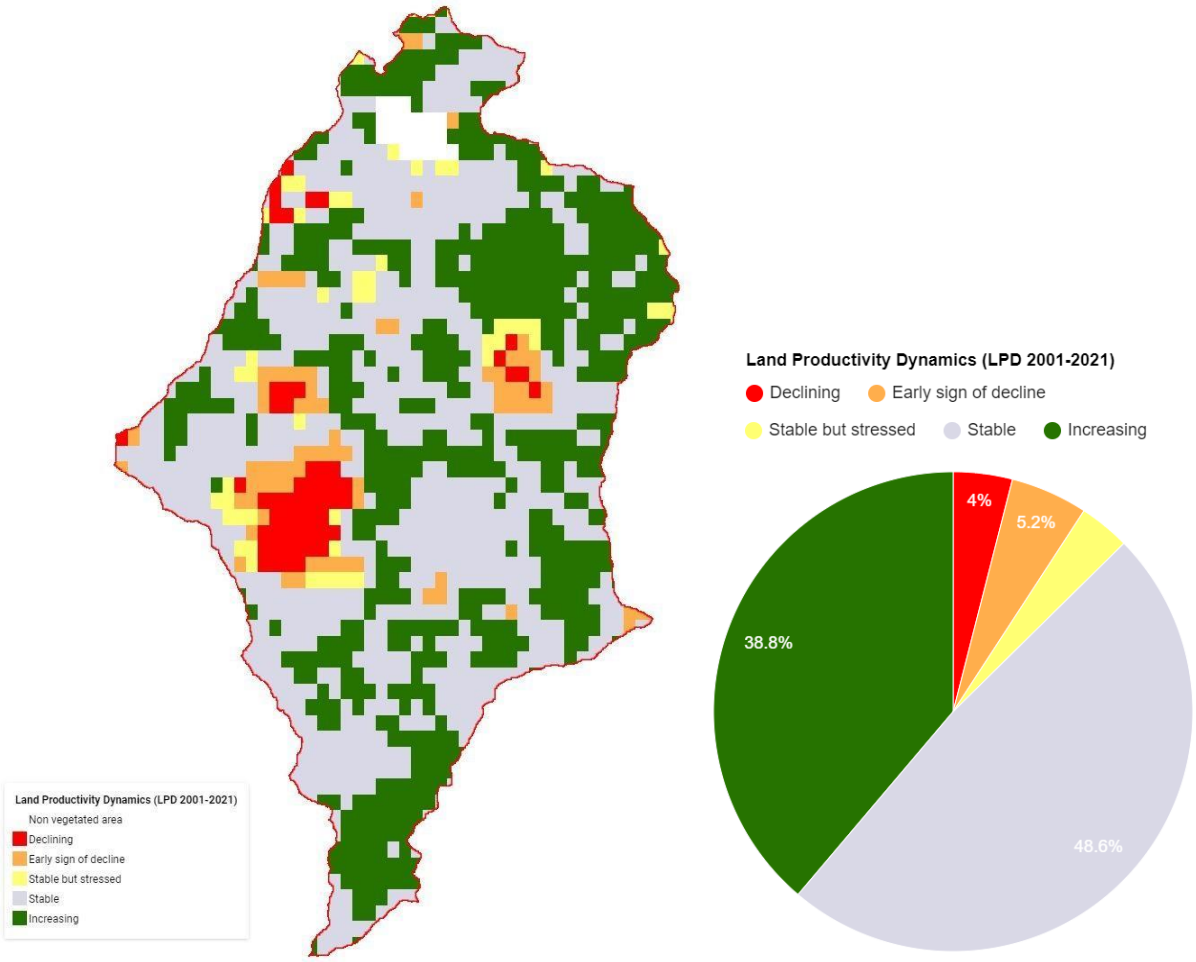


Figure 20. Land Productivity Dynamics 2001 – 2021

Looking at the land productivity dynamics data between 2001 and 2021, declining is 262.64 ha (4%), early sign of decline 343.09 ha (5.2%), stable but stressed 225.86 ha (3.4%), stable 3199.18 ha (48.6%), increasing 2555.50 ha (38.8%) (**Figure 20**). When we look at the declining areas, it is seen that most of them originate from the rejuvenation cuts made in the forest areas.

Sarikum basin is not under severe desertification pressure due to its location and climatic features. Considering the desertification model data of Türkiye, Extremely low 32.23 ha (0.5%), Very low 838.55 ha (12.5%), Low 2446.43 ha (36.6%), Low-moderate 2461.17 ha (36.8%), Moderate 648.31 ha (9.7%), Moderate-high 110.78 ha (1.7%) (**Figure 21**).

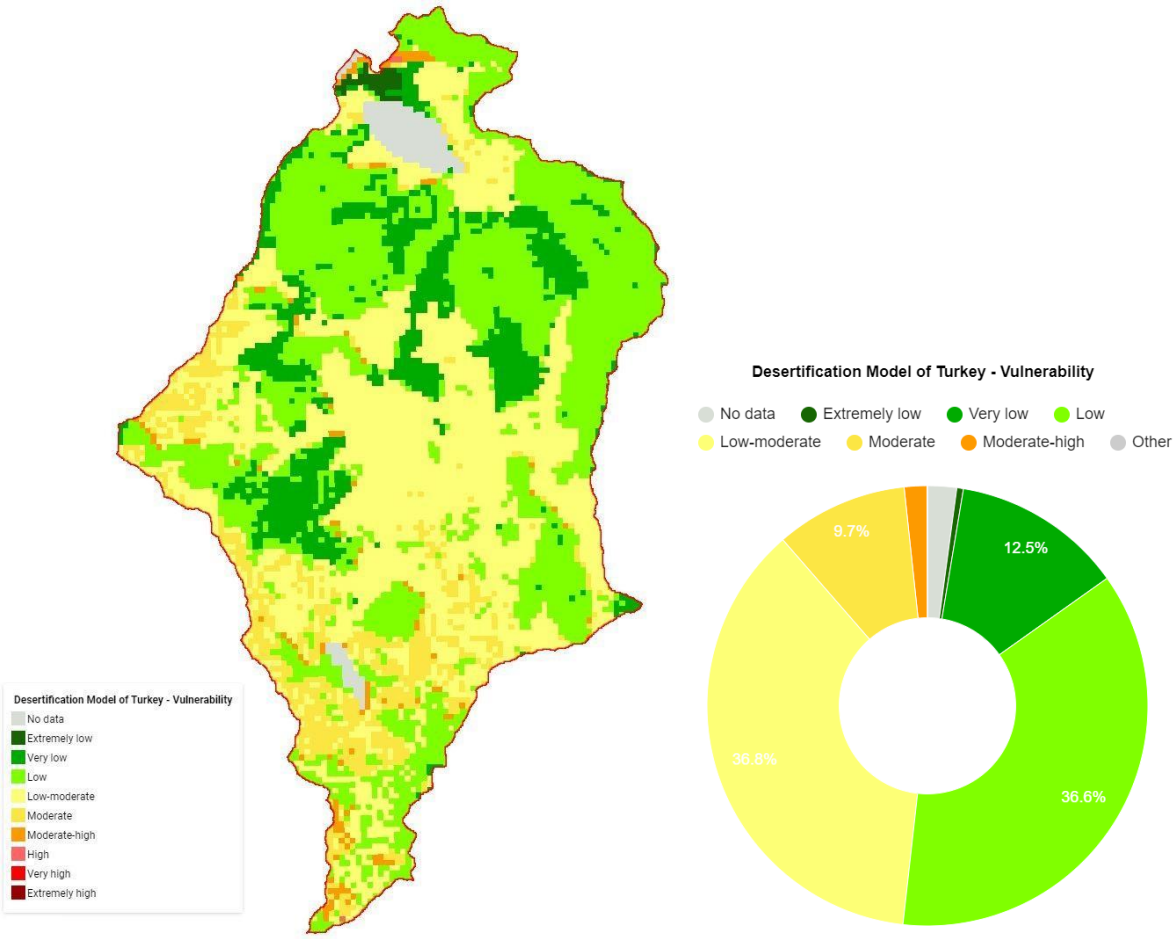


Figure 21. Desertification model output of Türkiye

Considering the land degradation map of the Sarikum basin, degradation was determined as 380.74 ha (5.7%), Stable 2266.65 ha (33.9%), Improvement 3925.93 ha (58.75%) (**Figure 22**). Most of the deterioration in the basin is the negative changes in the land cover within the scope of forestry activities.

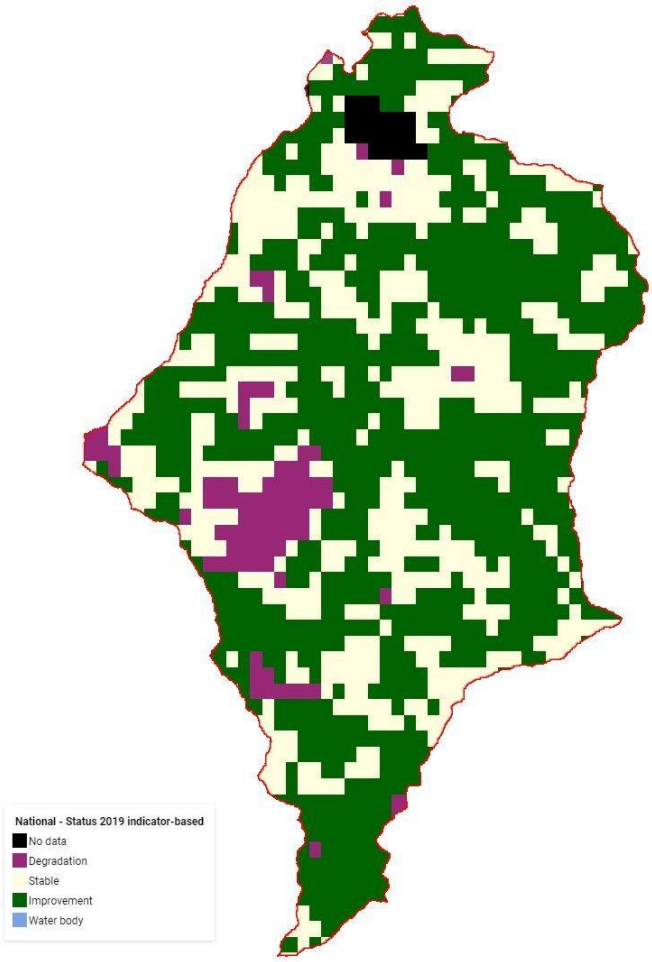


Figure 22. National SDG 15.3.1 land degradation layer

The data within the scope of this section has been obtained from Turkey's LDN DSS application. Türkiye's LDN DSS application was developed to support decision makers to achieve LDN in Türkiye, under the GEF funded Land Degradation Neutrality, Upper Sakarya Basin Project (GCP/TUR/065/GFF).

REFERENCES

Renard, K., Foster, G., Weesies, G., McCool, D. and Yoder, D. (1997) Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE). US Department of Agriculture, Agriculture Handbook No.703USDA, USDA, Washington DC.

Schwab, GO, Frevert, RK, Edminster, TW and KKBarnes, 1981. Soil and water conservation engineering. Wiley & Sons, New York etc., 525 pp.

ANNEX 10. PHOTOGRAPHS OF GENERAL FIELD STUDIES

(26-27 January 2023, 2-16 March 2023)



















































































ANNEX 11. PROPOSED ECOTOURISM AREAS

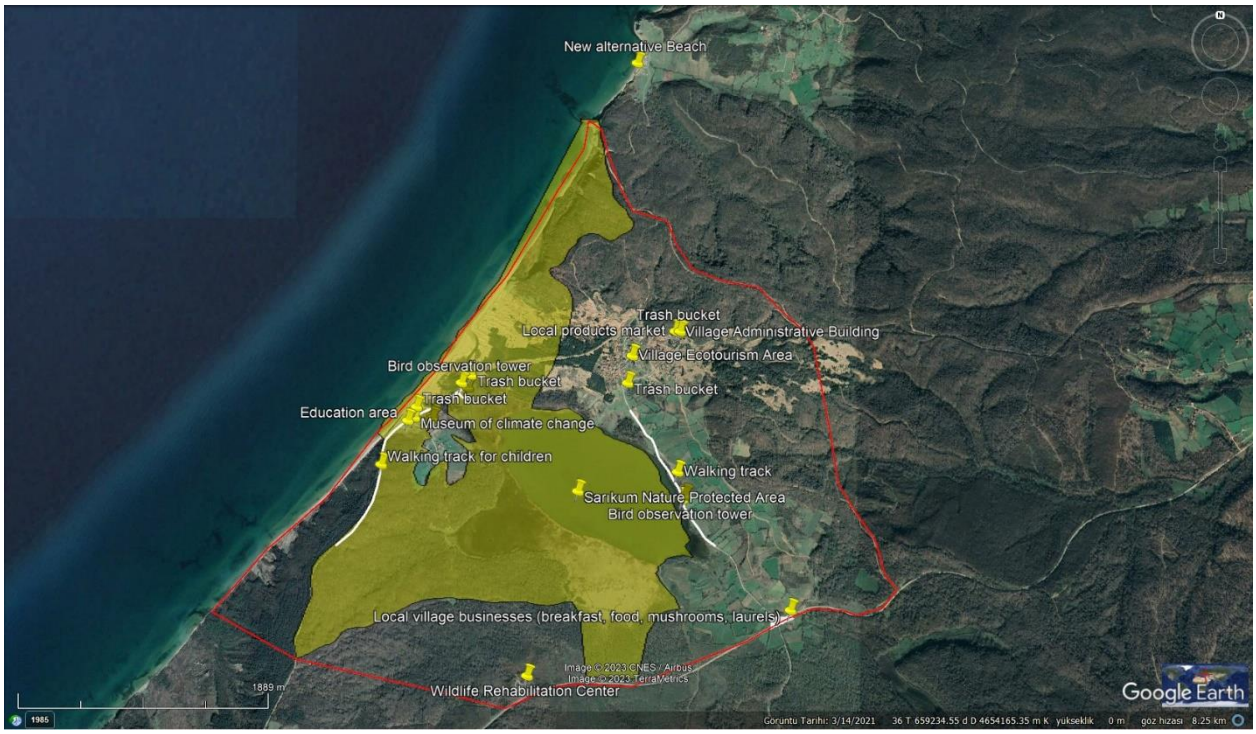


Figure 1. Map of the proposed ecotourism areas.

Yellow stands for the area of the protected area. The newly proposed ecotourism areas and the new alternative beach are out of the protected area. The museum of climate change, bird observation tower and education area are in the protected area. Local market to sell food, mushrooms and goods is out of both the protected area and the village and it is near the highway.

ANNEX 12. Socio-Economy Based Ethnographic Research Report of Sarıkum Village

During the field studies for the implementation of the project, fieldwork visits to Sarikum Village, interviews and ethnographic research process were finalized in March by Assoc. Prof. Dr. Aysegul DEMIR, Assistant Prof. Dr. Mehmet Samet ERDEM and the staff of the Sinop General Directorate of National Parks, in approximately three weeks under the guidance of Mr. Ümit Durmaz, Sarikum Mukhtar (local director of village in Turkiye).

Demographic Characteristics:

Number of People Living in a Household (active): 124 (total)
Woman: 62 Man: 62

Number of Children Aged 0 – 6 Years: 11 (total)
Woman: 7 Man: 4

Number of Children Aged 16: 113 (total) Woman:
51 Man: 62

Number of Children Residing Outside the Village: 86 (total)
Woman: 42 Man: 44

Number of Children Going to University: 17 (total)
Woman: 10 Man: 7

Number of Retired People: 31 (total)
Woman: 5 Man: 26

Number of People Working in the Public Sector: 19 (total)
Woman: 7 Man: 12

Number of People Working in the Private Sector: 40 (total)
Woman: 9 Man: 12

Number of People Working Abroad:
4

Number of Small Head Animals:
100 (total)

Number of Large Head Animals:
98 Cows (total)

Number of Poultry:
Chicken: 181
The Goose: 84
Duck: 5
Turkey: 2

Income from Animal Husbandry (Monthly):
Household 1: 4000
Household 1-2: 6000
Household 7: 2000
Household 21: 1000
Household 23: 20.000
Household 27: 7000
Household 30A: 1000

Types of Agricultural Products:
Animal feed, Vineyard, Garden, Greenhouse; Wheat, Corn, Barley, Watermelon, Nuts, Vegetables

Income from Agricultural Products (Monthly):
Household 2: 500
Household 4: 1500
Household 30-A: 500

Income from Beekeeping Products (Monthly):
Household 53:2000

Income from Fishing (Monthly):
Household 50: 500
Household 57: 3000

Number of Tractors:32 (toplam)

Agricultural Tools:
Trailer: 24
Harrow: 11
Plow: 14
Mowing The Grass: 7
Plough: 3
Collection: 2
Binding machine: 1
Scoop: 1
Incubator: 1

Number of Boats:9 (total)
Collecting Activities and Income Generated during the Season (Mushroom):
Household 7: 2500
Household 27/30-A: 2000
Household 32/63: 1000
Household 37: 10.000
Household 23/50/53/54/56: 7000
Household 55: 6000
Household 57: 40.000
Household 70: 500
Household 75: 25.000

Number of Garages, Warehouses, Poultry Houses, Barns:
Garage: 26
Warehouse: 2
Coop: 33
Barn: 25

Type of Residence:
Concrete: 36
Wood: 5
Prefabricated: 3

The Amount of Land Owned:
Between 1000-21,000 m²: 25 Households
Between 22.00 Dec-43.000 m²: 9 Households
Between 44.000-65.000 m²: 3 Households
Between 66.000-88.000 m²: 2 Households
Between 89.000-200.000 m²: 1 Households

Carbon Footprint:

Your Eating Habits Can You Describe It?
I eat meat every day: 0
I don't consume meat in my meals: 1 household
I consume meat several times a week: 43 households
Do you recycle your waste? (Plastics, metals, glass, paper and cardboard)
I recycle: 1 household
I don't recycle: 43 households
Your electricity consumption amount per month how long is the average? (tl) Between 150-250: 15 households Between 250-351: 13 households Between 352 -452: 4 households Between 453-553: 1 households 554 and above: 5 households
Your amount of propan and butan gas consumption how much is the monthly average? (tl): 0
Total coal consumption last year how much was your amount? (tons): 0
How many times a month do you use the cargo service (bring, banabi etc. including applications)?: 3 (total/household)
How many personal goals have been achieved in the past year have you made a domestic flight? (The round trip should be calculated as 2 flights.): 36 (total/household)
Last year with a personal goal how many international lines (your own continent did you perform the flight (at scale)? (The round trip should be calculated as 2 flights.): 4 (total/household)
For personal purposes on a daily basis the one you use the most on your travels can you specify the means of transportation? Automobile: 22 households Small Tractor: 4 digits Tractor: 5 households Wheelchair: 1 household
I do not use public transport or private cars: 7
I only use public transportation: 9
I use both public transport and private car/taxi: 4
I only use a private car/taxi: 22
Do you specify the fuel type of your personal vehicle?: Diesel: 21 households Gasoline: 10 households

Methodology: With the Decision of the Human Research Ethics Committee numbered 2023/44, ethics committee approval was obtained for the field work of the project. Within the scope of the project, in-depth understanding and interpretation are aimed. Methodologically, the method that was conducted in Sarikum village, which represents a small group in accordance with the studies of village sociology, and gives the best result is ethnographic research applied to tribes, tribes and small groups in qualitative research.

Since these studies are conducted for exploratory purposes, the information to be obtained is also in this direction. The research will be analyzed within the framework of qualitative research methods, which constitute the focus of the understanding-based method of the interpretive paradigm. The sample of the research consists of adult individuals over the age of 18 living in the village of Sarikum in Sinop Province. According to the data obtained from the headman's office in the village of Sarikum, there are 49 households that are actively living. Interviews were conducted in a total of 44 households that were suitable for visits. In-depth interviews were conducted with adult individuals over the age of 18 (women/men) living in these households through the socio-economic questionnaire, which was also prepared before in line with the subject and purpose of the project. Visits were made to the households located in Sarikum and interviews were held in the households. The interviews were conducted according to the door number system in the village households according to the appointment system to be taken in advance under the guidance of the headman (Mukhtar). The interviews were conducted in the company of the village headman, again applying for the guidance of the headman. Standard questions were asked for demographic factors and Carbon Footprint, unstructured and exploratory questions were asked for ethnographic interviews. In the research planned on the basis of a focus group interview, interviews were conducted mainly with chats aimed at obtaining information focused on sincerity and trust between the members of the household and the project team. The interview periods have been increased in order to get more detailed information from women individuals in line with the subject and purpose of the project. Ethnographic interviews were conducted in the research.

The Socio-economic questionnaire form containing questions about the unstructured interview technique was used. Based on the in-depth qualitative research technique used in ethnographic interviews, the questions were applied unstructured with questions containing the relevant topic. Focus group interview, observation, note-taking techniques were mainly used in the research.
The duration of the interviews with women in unstructured questions was kept flexible. Materials such as audio recordings, photos, videos were used in the interviews.

The duration of the interviews is 30 minutes depending on the status of the interviews. Interviews are at the stage of converting transcriber audio and video to text, creating a raw data source after the program and manual transfer to MS Word media. After the transfer process to MS Word media is completed, the data source will be categorized and analyzed. From the data obtained, in addition to the classical description method, coding will be performed with the support of professional computer-aided analysis with the MAXQDA 2022 program and themes will be presented in the findings section.

Population: It has been observed that the population of Sarıkum village consists mostly of elderly individuals. Most of the individuals who actively live in the households visited are elderly individuals. It has been determined that the young people in several households are actively residing in the village. In this context, it is envisaged that Sarıkum village exhibits a development in which the service sector and tourism can come to the fore along with the potential of becoming a place of resort in terms of the emerging antecedents related to the population.

"Everyone, you can't hold anyone on the right and left. And how will you hold it? There is no field! what should the child do now? How will he hold it? Everyone's hungry. What'll you do? It's either going to be thrown there or it's going to be thrown here. We were three brothers. They divided the land from the father into three. I have two sons now. I don't have a place to build a house here now...Oh, I'm sorry, if he got married, he wouldn't stay here either. It's not caused by children, it's caused by women. There are no girls coming to the village either. How am I going to live in the village?. Everyone wants to go to the city. I mean, the woman, the man, this is the next cycle from now on."





Education: It is determined that the individuals living mainly in the village are mostly retired and have a primary school degree as an educational level. There is a village school close to the village, however it is not located in the village.

Since most of the residents of the village are elderly, the answers given in the questions asked for education usually start with the sentence “who is left ...”. On the other hand, there are also demands for the village school to be put into operation and for educational life to be realized on site. It has been stated that the education of the current students who continue their education life in the village is maintained with transportation education. It has been stated that the village school used to be active, but the fact that young people settled in the city and the weight of the elderly population affected the situation.

Family relations: The village generally includes a history going back one hundred years with the migration of three families when viewed as a family tree. There are primary and close relations based on kinship relationship between households decently in the village. Family relationships are located within the traditional family structure.

“Before that, your mothers were at work exactly one hundred and fifty-nine years after your fathers. I am not from this village. Me, my sister in-law, my mother-in-law, my father-in-law, we were together for fifty years. Until when we broke up in 2007. We just broke up. We were always living together before.”

Mostly elderly individuals are actively residing in households, and a nuclear family (elementary family) model consisting of elderly individuals prevails.





Family relations in the village are mostly the household visits of the children of the residents living in the city. From this point of view, it is seen that the young generation, which continues its life in the city, has not severed its connection with village life. When asked about the young people's life in the village, it is often stated that returns may be possible only when they retire.

The fact that the residents of the households in the village are mostly relatives reveals their commitment in their relationships with each other. Because in the village, each individual is familiar with another.



It is observed that patriarchy is dominant in terms of gender norms in domestic relations.The position of women: In the division of labor, usually in domestic work (dishes, laundry, cooking etc, it has been observed that women are mainly supporting the labor power. In non-domestic jobs such as gardening, field, animal husbandry (poultry, sheep, cattle). It is observed that there

is a division of labor in which they are supported together with their spouses. In this sense, it is possible to say that women's labor, labor force, contribution exists in agricultural production.











In addition, women contribute to production in activities such as mushroom picking, bay leaf picking and sorting. Milk and dairy products, animal products are mostly produced as self-sufficient, very few households convert production to marketing. In addition, they produce the products they make such as canned food and jam as a qualification both for themselves and for their children living outside the city. An economic production here again turns into self-sufficiency. There are requests such as boarding houses, opening breakfast places, folding and selling (marketing) in the village. Even if online sales are desired in the village, the entrepreneurial female profile also appears in front of us. They stated that if there are supports for this, the village will be attractive for young people.









“Leaf. Either there is a bay leaf or it goes to the soap shrine. This oil is being removed. Huh huh. They sell by the kilogram. It is brought and taken wholesale. There's nothing else we do... the monthly average, I mean, if I give a figure, I don't do it all the time. It doesn't happen every day here. It doesn't happen every day. We have been doing this now for three or four days. About 500 liras per month. So the income is not a regular income. The pension is regular, but what you do outside of it is not regular”

“The laurel thing has been happening recently. Aha, he's been here for two or three years.”
“Were there a hundred sheep? Which one should I tell you about, Ben? How can I tell? We used to make cheese. We used to give milk to the milkman. we used to make oil, we used to sell it. We used to make cheese, sell it. We would have appointees. We boiled the precipitate, the buttermilk coming out of the churn. It was more precious than cheese, it would be like cheese.. There is no now, what should we do. These are not produced. I was giving milk to the milkman once. Recently, the milkman has been bringing everything, you know, dry food. I also took the animals' food.”




They stated that animal feeds in the village, especially the feeds bought for poultry, were not wrapped in the past. Now, they have stated that the quality and quality of the feed they buy negatively affects poultry and the foods they obtain from them, such as meat and eggs. They stated that the organic and on-site production of animal feed should be supported.

Handicrafts: It has been stated that there are rugs that women used to work as handicrafts in the village. In the village, measures and incentives for linen processing for textiles, motifs from forest products, clothing production activities with traditional unique motifs can be supported.

"They do a lot of oya. We are famous around here. They used to do it. People had sheep, property. They used to weave rugs. They used to say it was late. It would take the place of these things. A blanket from our bed would be very nice. And now no one is doing it. Aha, there was a bag from my mother, I'm keeping her waiting. They also asked for a lot of money for buying it, I won't give it. It's still there. A bag of delays, that is, a bag of provisions.

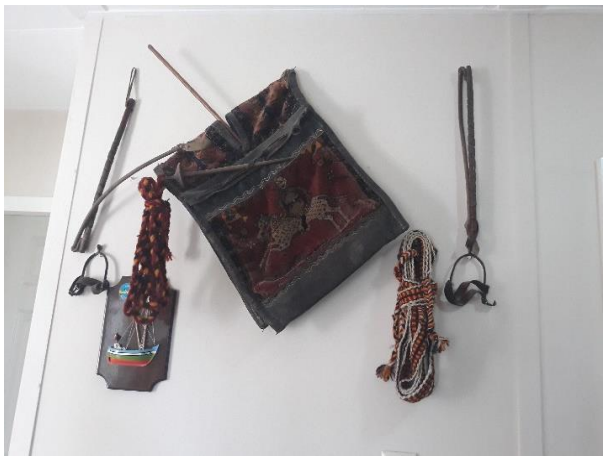
"There are no women working here, there are no employees. Always in the field, in the garden. In the field that sows few fields. Like this, so everyone goes home to work. And now they're making laurels. If someone brought it, I'd take it out, emme. I would do it if the one who brought them here tore off their tops...by God, I don't know what they will do. Everyone is at home, at work. But I think they should do everything in their power. I wish rugs and bed linen would touch the earthquake zone."

“Years ago, when we were children, they used to set up a stall here. They used to weave rugs. They used to call me cecim. It hasn't been done for fifty years, brother. If you ask. Yes So. They used to make pile bags for shepherds who wanted such woven wool with such tassels on their backs and so on. Even I can't find them and keep them as a souvenir now”











Economy/Development/Livelihoods: The livelihoods of the villagers mostly include fishing, agriculture and animal husbandry. It is also revealed as a result of interviews that most of them are based on coastal and forest ecosystem services.

“We have no income from the land. Only the vegetables that we will eat from the soil that we will make in the summer, there is nothing else. Ha, now the grocery store is coming. Here in front of the house, the veggie guy comes, the greengrocer also comes. There is God, the bread maker is coming, they are all coming. If you go to a doctor, you will also go to Sinop. There is nothing else like it. He meets the needs of the child. Then they'll take us too. They bring it like this.”

“Let something new come, young people do not exist in the village. What should we do in houses with two people, two people?”

“It's milk. He takes a cheese nap sometimes, ma'am. Sometimes milk cheese, but not very much. From time to time. Not for sale. I already have a family of children. Do not let the increase deteriorate at work.”

Well, there's nothing here. Plain beans, corn, wheat. There's nothing else. Wheat, corn, pepper, eggplant. Aha, and pepper, eggplant, we need ourselves. Up to ourselves”









It is seen that there is no surplus of production and that there is a cycle that they use for themselves again when there is a residual product. For the most part, there is no economic transformation in production and market access remains poor.





The lack of human power is the main reason for this situation. In the village of Sarikum, which performs a self-sufficient production, opening the way to market access and encouraging it is seen as a priority step. The retirement income of the majority of the village people also directly affects the potential of contributions to production.












In the heating requirements, there are negative statements about the necessity of meeting the fuel with wood and, on the other hand, about the fact that the fuel is paid, as well as suggestions for reducing the fees.






There is a question of ending buffalo farming activities due to road-born infrastructure deficiencies. For this reason, village residents have set demands for about 2-3 km in order for

their animals not to land on the road. From this point of view, it is necessary to take measures against this risk by preventing habitat division. There is a middle class among the village people, where there are those who want to be interested in buffalo farming activities. It has also been stated that the most important risk for this is the age factor. It has been found that the young people in the households mostly live outside the village. They express that their wives' (women's) preferences for the city and the education of their children prevent them from living in the village. They also state that if supports and improvements are made to buffalo farming activities in the village, they will welcome young people to buffalo farming activities in their villages and they will be interested in this work.
It is seen that cooperativism is no longer carried out in the village.

"Or it was happening, but here are people, some saidsomething, some said other things and, they are finally closed ...the Agricultural Development Cooperative. Agricultural Development... And what were we doing? We were getting three and five cents from the president of the cooperative when we needed money. We were giving back when we were working. So that was the benefit. In other words, we worked in a restorative procedure to the state. He was cutting one or three or five cents out of you from there. That money was staying. That's the percentage, too. Activity here is forest transportation.,

"We have the forest, we have the wood, all of the factories are in Kastamonu. Actually, I mean, if there was a factory people would work. So there is no production here.
For example, there is a factory in Kastamonu. The tree, the wood of this place, goes to Kastamonu. Jobs in the factories there"

There is a demand to support goat husbandry. As a reason for this, the geographical conditions of the village of Sarikum are suggested to be favorable. It is stated that sand is an important factor.

There are also thoughts about the land shortage and the need for manpower:

"We don't have any land. If we were to do a business, we can't do business without land.Like, aha, everyone has a ten-acresplace over there. Wheat is missing. Most of them are retired. Most of the clients. And I turned seventy myself, you know? If they give me every world from now on, I can't do the right job. Did you get it?"

Pandemic Process: The quarantine of the entire village for 14 days on October 22, 2020 directly affected relations in the village. The fact that the population of the village is predominantly elderly and they are in a risk situation has directly increased the social distance as well as increased the fixative distance. In the general economic impact of the pandemic on the villagers, it has been seen that it is based on traditional neighborly relations.

"By God, we don't come and go to each other like that, we see each other on the streets, we talk. Talk from balcony to balcony"

"We used to come and go to each other a lot. So it's hard now. When that virus entered, everything disappeared today."

During the pandemic, there is a sharing based on assistance and solidarity between the affected households and other households.. Although the pandemic process has increased the social distance, the primary close relationships of the individuals living in the village with each other play a catalytic role in operating the mechanism of being aware of each other.

Disadvantage: Old age is emerging as the most important disadvantage of the village. The fact that women are also elderly in the village shows an important risk of the age factor in the production process. It has been reached that there are also disabled individuals among the household members in the village.
It has been stated that a disabled child with Down syndrome lives outside the village in Sinop province, but they often visit adult family members in the village. In addition, it has been learned that two mentally disabled brothers live in the same household with their other siblings as an extended family in the village. There is another disabled person who cannot use one of his legs as a result of diabetes.










They have added various tools to the household by strategically deciphering the obstacles encountered among the disadvantaged individuals living in the village.




Among them are tools that will facilitate access and their life, such as an elevator, a handle. The use of the elevator in the village also represents a precedent for unimpeded access in this sense.

Transportation/Accessibility: There is no public transportation in the village. The village people carry out the transportation either with the communication system they made before through the

neighbors or with their own vehicles, if any, with the help of pat pat. Services for the improvement and maintenance of village roads are emerging as their priority needs.



Since the residents of the village are mostly elderly individuals, when they need to go to the city, they fulfill these requirements through their children living in Sinop. Grocery store for shopping in the village, grocery store etc. such jobs do not exist. There are also demands for this. It can be said that there is almost no cargo service in the village. The needs are usually provided with the headman, neighbors and relatives.

There is an internet infrastructure in the village and internet service is offered. However, most of the elderly individuals do not benefit from this access. Internet use is mostly observed in adults who are younger. There is a TV in almost every house. Although there are those who use television to avoid their loneliness in their daily lives, there are also those who almost never watch it.

Tourism: More sustainable use of the area should be planned and the possibility of alternative beaches should be investigated. Contribution to employment can be offered when opportunities such as a walking path, cafe, sightseeing area are offered.

“Nothing has been done about tourism. It’s done. Aha, there's a hotel in the back. They invested the state's money. It stands idle. So he, he's a separate issue anyway.”

It may be suggested to offer alternative venues for the sale of local products and the gathering of village people.

Migration: Village households usually associate migration status with retirement. They also stated that there is a seasonal population increase in the village during the summer months. In addition, the potential for reverse migration of family members due to the recent earthquake is also taken into account.

“There are no retirees coming.”
“It's more crowded in summer. When people in Istanbul have school holidays, there are crowds here. Fifteen, sixteen inhabitants if they come here.”

When village households are viewed as a historical background, they is a small structure consisting of a few families who migrated from Samsun province, where the kinship network similar to the tribal and tribal structure on a micro scale is dense.

Hunting: As a result of negotiations in village households, the issue of hunting comes to the fore to a large extent. There are those who are satisfied with the controlled hunting, those who identify hunting with their lifestyle, those who react negatively to those who come from outside and do hunting, those who want hunting to be permitted to the village people.





With an awareness and awareness-raising education to be conducted on hunting, the way for reconciliation decoupled between the National Parks and the village people can be further opened. Most of the households interviewed stated that they suffered from hunting. Transferring the importance of the issue to the village people is important in terms of preventing the negativities that may arise in this regard.

Environment/National Parks: Fires are emerging as the primary problem of the village. The demand to prevent fires caused by negligence,careless and sloppy use of the environment by

visitors from outside the village is on their agenda. It is among the other priority issues in the garbage that visitors from outside to the village decant to the environment.





Demands and problems related to the smell of animal mites are also expressed.





The aim of the project is to decipher the relations between the village people and institutions through socio-economic based ethnographic research. Thus, on-site detection of deficiencies caused by management becomes possible. The first stage of building a bridge between the people of the village and the national parks with household visits has been realized.








The opinions of the village people about the environment and National Parks are the basis for awareness. Because in order for the village people to fully understand the task and purpose of National Parks and to eliminate the conflict that will arise in relations, it is necessary to conduct information studies.




Increasing Decals and putting up photocaps for being a protected area are also among the demands and measures. The claim of pollution of Sarikum Lake and situations such as increased mosquitoes and odor in summer are also among the most frequently described issues.
The absence of malaria compared to the decrepitude is also among the important examples given among the environmental history of the village. In fact, the decrease in the number of birds over the years is also associated with the pollution of the lake by the village people. However, there are also those among the interviewees who stated that this situation happened because of hunting. In addition, it is also stated that measures should be taken such as a guard system for protection, security, surveillance purposes, a camera system.

"The protected area is comfort. When there used to be no guards here, he used to bring men, set them up here, drink at the table, knock, knock, disturb them here at night. Now he has disappeared comfortably, he is gone. Fires were burning, rifles were exploding."

It is observed that the measures aimed at the status of national parks and their becoming protected areas have positive effects on the issue of crime. In most of the interviews, it is stated that the practices made both regarding hunting and the protection of the village bring calmness and tranquility in terms of security.

Social Cultural Activities: Social cultural activities in village households are expressed as household visits. There are no places in the village where they can interact in public areas such as coffee shops or cafes. The family tea garden with its current building is not active, it is not operated. However, as a result of the conversation with the female interviewer, the owner of the place, she stated that she wanted to be employed and volunteered to work effectively with her children if the existing business became active. The mukhtarlik building located in the village was also designed as an indoor indoor space in order to increase social interaction. The fact that

the Mukhtarlik building also becomes active and effective in order to carry out social and cultural activities is also taken to the fore.





Some of them are satisfied with this situation, but there are wishes that it would be good for some of them. Their daily life is usually in the form of working on production tasks such as agriculture, animal husbandry, gardening during the day, and visiting each other in households during increasing times.

Health Services: There are no institutional places such as a primary health care center. where health services can be performed in the village. Health services are provided by a health officer who comes to the village once a month.
Inspection service is carried out by means of a stretcher placed inside the Headman's building as a venue. When health care is needed, services are provided through neighbors or family members living outside the city. When an appointment is requested, the needs are met again through the children. Since there is no public transportation in the city, the vehicle is met again through neighbors and family members when needed.

Infrastructure Services: It was stated that sewerage is the most important infrastructure problem. From this point of view, reconsidering the bans related to the issue in National Parks by taking into account the quality of life of the people and taking measures to eliminate sewage problems with an environmentally friendly approach are emerging as the priority of the village people.





The people of the village use simple strategies that they have developed themselves in order to take measures against the sewage problem. The provision of services aimed at Decongesting priority needs such as toilet services is also among the opinions expressed.

Rituals: The construction of the mosque in the village has not yet been completed. There is currently a village imam in the village. Within the scope of the research, the household of the village imam was also visited and both the status of the village and their status as a household were





The people of the village perform the rituals of mosque worship on Fridays. It is observed that the general structure of the village is mostly traditional and religious. From this point of view, religious rituals are of importance. The mosque has not been in the village for a long time. During this time, rituals were performed in the city or in mosques close to the city. Transportation, on the other hand, has been compensated through neighbors, relatives, relatives. It turns out that the village people's approaches towards the mosque imams are distant. While the villagers demand attention from the mosque imam, the mosque imam states that the villagers do not internalize the foreigners outside the village. They stated that there were almost no neighborly relations during

the short period of time they stayed for as long as six months, so they wanted to move as soon as possible.

Location: The spatial structures in the village differ from each other. In general, the layout and layout of the houses are close to each other. The issue of intra-village transportation and accessibility is convenient in this respect. It is observed that the owners of the more ostentatious households in the village are individuals who live abroad or are retired from abroad. For the most part, the households are large and spacious, while the average number of people actively living in households is two.







In addition, the presence of tractors and other vehicles in every household shows the importance of economic status indicators in the village.






A variety of reinforced concrete, wooden and prefabricated houses have emerged in the households in the village.






In some households, modern elements have been included in the domestic architecture. Especially in some households, ready-made kitchens or specially made kitchens attract attention. Electrical household appliances are located in almost almost every household. It is seen that modern technology is used in village households.

In addition, there are houses with stoves and houses with heating in the village as knut (wood) type. Heating is carried out with both types of wood. Toilets are located inside the village. The system is configured so that the sewer mite goes outside the house into the garden. Almost most households have a fencing system that is made just like fields.

Management: As a result of the interviews, it turns out that the village of Sarikim quite likes, respects and trusts its current headmen. It is seen that the village people are satisfied with the administration. It has been observed that the mukhtar's awareness and awareness of the households in the village is high. The realization of interviews with the door number system during visits to households through ethnographic research has shown that there are also some

changes in households. With this system, it is necessary to renew, edit and review the door numbers in some households.













Regarding the participation of women in the administration, it is stated that women living in the village do not have direct participation in the issue. When asked about this issue, it was stated that women indirectly contribute to the administration through their spouses. In village households, it is the case that one of the female interviewers is willing to the subject, and a young woman is also suggested by a neighbor and relative.

Unstructured Questions:

1. How do you carry out your domestic and non-domestic affairs in your daily life? How is the division of labor in the family being done? How are your family relations?
2. How do you make a living? How do you assess your contribution to the domestic economy?
3. Are there any jobs being done in your village that women can participate in? Women's economic contributions? What jobs do you suggest women should do?
4. What are the difficulties of living in Sarikum village? What are the situations that force you the most? How do you deal with the problems you face?
5. What is being done in your village in terms of women's participation and representation in society? How do you evaluate your participation in life? The position and representation of women in your village?
6. Do you interact with other households in your village? Social-cultural activities, other activities, what are the ceremonies?
7. How do you assess the position of your village as a nature reserve? Production activities: do you carry out your activities traditionally? How is modern technology? Would you like to take advantage of technology?
8. When you think about the climate and nature together, should it be presented economically for your village, what are the opportunities you want, ask for? As different sectors in terms of economic development of the village what can be done?

Carbon Footprint - Demographic Factors (standard questions)

HOUSEHOLD NO.
Number of People Living in the Household
Number of Women
Number Of Men
Number of Children aged 0-16
Woman
Man
>16 Number of Children
Woman
Man
The Number of Children Going to University
Woman
Man
Number of Retired People
Woman
Man
The Number of People Working in the Public Sector
Woman
Man
The Number of People Working in the Private Sector
Woman
Man
The Number of People Working Abroad
Number of Small Head Animals

The Number of Large Head Animals
Number of Poultry
Income from Animal Husbandry (Monthly)
Types of Agricultural Products
Income from Agricultural Products (Monthly)
Income from Beekeeping Products (Monthly)
Income from fisheries (Monthly)
Number of Tractors
Number of Agricultural Tools
Number of Boats
Collection Activities and Income Generated
Number of Garages, Warehouses, Poultry Houses, Barns
Household Type (Reinforced Concrete, Wood, etc.)
The Amount of Land Owned
CARBON FOOTPRINT QUESTIONS
Your Eating Habits Can You Describe It?
I consume meat every day
I don't consume meat in my meals
I consume meat several times a week
Do you recycle your waste? (Plastics, metals, glass, paper and cardboard)
I recycle
I don't recycle
Your electricity consumption amount per month How long is the average? (tl)
Your amount of butane or propame gas consumption How much is the monthly average?(tl)
Our history year total coal consumption How much was your amount? (tons)
How many times in a month you use ordering services? (including getir, bana bi etc. applications)?
HHow many personal goals have been achieved in the past year Have you made a domestic flight? (The round trip should be calculated as 2 flights.)
Last year with a personal goal How many international lines (your own continent Did you perform the flight (at scale)? (The round trip should be calculated as 2 flights.)
For personal purposes on a daily basis the one you use the most on your travels can you specify the means of transportation?
I do not use public transport or private cars
I only use public transport
I use both public transportation and private car/taxi
I only use a private car/taxi
Do you specify the fuel type of your personal vehicle?