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An Investigation of the Studies on the Conservation of Biodiversity in Turkey

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Abstract: Considering our world as a whole, prevention of potential hazards and problems is possible by protecting natural resources in harmony with each other and ensuring natural balance. Therefore, conservation of biodiversity and natural resources is primarily a guarantee of the continuity of life on earth and a prerequisite of meeting the sustainable development needs of societies.

Illegal hunting practices that have been performed in Turkey for many years have led to a decrease in the number of wild animals or complete extinction of them. The Land Hunting Law No. 4915, which entered into force in 2003 in accordance with its counterparts in the world, contains provisions on the conservation of wild animals and their habitats against a variety of factors (legal basis). There are international biodiversity conventions to which Turkey is also a party. These conventions are critical in terms of conservation and sustainability of biological diversity. The 'Noah's Ark National Biodiversity Database' implemented in Turkey in accordance with these conventions is one of the critical projects in this field. This project has gained importance for the conservation and sustainability of biodiversity both in the world and Turkey.

The study includes the main headings of Introduction, Materials and Methods, Findings, and Conclusions and Recommendations, and the sub-headings of Protected Areas, Protected Areas in Turkey, and Studies on Biodiversity. The Conclusion and Recommendations section contains recommendations to preserve habitat and species diversity for biodiversity conservation and emphasizes the importance and framework of national and global conventions to date. Solutions were produced through a holistic assessment.

Keywords: Biodiversity, protected area, database, natural resource, Natura 2000

1. Introduction

To protect the right to life of all living organisms on earth, including humankind, natural resources should be well planned, protected and managed (Anon. 2011; 2011a).

Considering the environment as a whole in our growing world will generate healthier and more sustainable results. Prevention of all potential hazards and problems is only possible by maintaining the harmony and balance among natural resources. Conservation of biodiversity and natural resources is primarily a guarantee of the continuity of life on earth and a prerequisite of meeting the sustainable development needs of societies. The preparation of the management plans according to these criteria will ensure the achievement of the objective. These management plans aim primarily to manage protected areas more effectively. Effective management will be possible by adopting a flexible management style in line with the planning and by quickly adapting to changing conditions. Thus, the balance between

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nature and humans will be ensured and preserved (Anon. 2011; 2011a).

As a result of damage to forests, prey animals have also received substantial damage. Forests are one of the renewable natural resources of Anatolia, which has been the center of several civilizations from past to present. Illegal and irregular hunting over many years has led to a reduction in the number of wild animals or the complete extinction of them. Decisions of the Central Hunting Commission (CHC) established based on the Land Hunting Law No. 4915, which entered into force in 2003, contains provisions for the protection of wild animals and their habitats against a variety of factors. The current legislation, therefore, requires wild animals to be protected against various factors that jeopardize their health and populations and, if necessary, to fight against these factors (Mol, 2006).

As is widely known, biodiversity consists of three elements which are essential parameters of sustainable development. These are genetic diversity, species diversity, and ecosystem diversity.

There are international biodiversity conventions to which Turkey is also a party. These are essential for the conservation and maintenance of biodiversity. These conventions are Conservation of European Wildlife and Natural Habitats (Bern), Convention on Biological Diversity United Nations, Cartagena Biosafety Protocol, The Convention on International Trade in Endangered Species of Wild (CITES), Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona), World Charter For Nature, Stockholm Convention on Persistent Organic Pollutants, Forest Europe, Convention on the Protection of the Black Sea Against Pollution (Bucharest), Convention on Wetlands (Ramsar), Sevilla Convention, International Convention for the Protection of Birds (Paris), and Natura 2000.

The 'Noah's Ark National Biodiversity Database' implemented in Turkey in accordance with these conventions is one of the critical projects in this field. This project has gained importance for the conservation and sustainability of biodiversity both in the world and Turkey.

2. Materials and Method

In this study, assessments have been made using the existing laws and international conventions on the protected areas in Turkey and data and projects from the General Directorate of Nature Conservation and National Parks (GDNCNP) and General Directorate of Forestry (GDF).

Studies conducted on biodiversity in previous years have been examined and used in the study. Besides, the data from the fieldwork conducted in 'Inventory Studies in the Wildlife Development Areas of the Antalya Region' by Uyar (2018) has been used, and some local studies have also been discussed.

Biodiversity in Turkey is protected by different laws and different protected area statuses. Some of these protected areas statuses are based on national legislation, and some are based on international conventions.

European countries have the following projects in this regard: MACIS (Minimisation of and Adaptation to Climate Change Impacts on Biodiversity,) ALARM (Assessing Large Scale Risks for Biodiversity with Tested Methods), BioAssess and Biopress Project, Eururalis Project, IMAGE (Integrated Model to Assess the Global Environment), CLUE (Conversion of Land Use and its Effects) model, SEBI 2010, LIFE-Nature projects, IUCN projects, and BioForum project. Turkey has the following projects: Protected Areas Management Information System, Land Monitoring System, Forest Information System, Meteorology Database, Noah's Ark National Biodiversity Database, Wildlife Database, Afforestation Database, Water Database, and European Spatial Data Infrastructure (INSPIRE). Thus, the health conditions of European forests and Turkish forests are monitored, the possible risks are determined, and necessary measures are taken (Unal et al., 2015).

3. Findings

A wide range of studies on the conservation and development of biodiversity in both Turkey and European countries and the principles for the use of these studies have been presented.

Projects related to forestry are shown in Table 1. As can be inferred from Table 1, the period covered by the projects is between two to five

years, and almost all of the databases and analytical systems related to forestry also concern biodiversity (Unal et al., 2015).

In addition to the existing national projects on biodiversity in Turkey, there are General Directorate of Forestry - Preparation of Biological Diversity Action Plan, Conservation and Sustainable Management of Biodiversity in Yildiz Mountains, On-Site Conservation of Genetic Diversity Project (GEF-1), Biodiversity and Natural Resource Management (GEF-2 Project), Biodiversity of the Anatolian Diagonal Project, Strategy and Action Plan for Increasing the Capacity of Civil Society Organizations Regarding Biodiversity, and Biodiversity Symposium (Anon.2018f).

Table 1. Databases related to biodiversity and analytical systems projects

Project Name:	Start and End Date:
Desertification Monitoring System	2005-2006
Development of Forestry Information System in Sustainable Forest Management	2006-2009
Forest Fire Detection and Monitoring Systems Based on Computer Vision	2007-2009
Econometric Modeling and Estimation of Round Wood Demand in Turkey	2007-2010
Mediterranean Model Forest Network Project	2008-2012
Establishing a Foundation for the Turkish National Forest Inventory-Phase 1	2009-2010
Tracking System of Wood-Based Forest Products	2011-2012
Wood Energy Education Network Project (WETNet)	2011-2013
Turkey Forest Fire Danger Rating System, Meteorological Fire Index System (TOYTOS)	2013-2015
Mediterranean Forests With High Conservation Value Integrated Management Project in Turkey	2013-2018

In the study, these are explained in detail under the headings of “protected areas”, “protected areas in Turkey” and “studies on biodiversity”.

3.1. Protected areas

To prevent excessive and incorrect use of natural resources, to use and manage them based on scientific principles and to ensure their adequate protection, attempts have been made in many countries to ensure that natural resources take the status of protected areas (Akten et al., 2012).

The protection of the ecological balance and the prevention of exposure of natural resources to unplanned human interventions can only be achieved through the establishment of protected areas systems that will enable cooperation on both national and international scales. For this cooperation to be easy and practical, compliance with internationally accepted standards should be emphasized (Hepcan and Guney, 1996).

“International Union for Conservation of Nature (IUCN)” is an environmental organization that includes 185 countries and over 1,300 government agencies and nongovernmental organizations. Besides the Ministry of Agriculture and Forestry, The World Wildlife Fund (WWF Turkey), TEMA Foundation, Nature Association (DD), Turkey’s Nature Protection Association (TTKD), Northern Nature Association (KuzeyDoga), and Kaz Mountain and Madra Mountain Union of Municipalities (KMBB) are members to this organization (Anon. 2018d).

IUCN defines protected areas as “areas of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, managed through legal or other effective means.” The Convention on Biological Diversity defines a protected area as “a geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives”. In the protected areas, primarily nine objectives are targeted (Dudley and Phillips, 2006):

1. Performing scientific research
2. Protecting the wildlife
3. Protecting genetic diversity and species
4. Ensuring the continuity of environmental services
5. Protecting specific natural and cultural characteristics
6. Tourism and recreational activities
7. Training activities
8. Sustainable use of natural ecosystems resources

9. Ensuring continuity of cultural and traditional qualities.

Studies on protected areas in the world from past to present and the change in the approach to protected areas according to Beresford and Phillips (2000) are shown in Table 2.

Table 2. Change over time in the approach to protected areas

Approaches to protected areas (previous)	Approaches to protected areas (current)
Planning and management without consulting the local people	Planning and management together with local people
Protection by the central government	Protection with stakeholders
Acting only for protection	Protection for social and economic purposes
Protection with a separate development scenario	Protection as part of a national or international system
Protected areas left as islands	Protection based on green corridors by developing a network where protected areas are surrounded by buffer zones
Protection of only visually beautiful areas	Protection based on scientific, economic and cultural facts
Management approach for tourists and visitors	A management approach where local people are involved more
Focus on protection	Focus on restoration along with protection
Acting as if protection was a national matter	Acting as if protection was a national and international matter

As can be seen from Table 2, the positive changes that started in the 2000s revealed the importance of technological products and thus more positive results were obtained. Thanks to camera traps, drones, dome system, night vision systems, modern computers and information archives that are the fruits of technological developments, healthy and fast applications are conducted at national and international levels (Uyar, 2018).

3.1.1. Definition and objectives of the IUCN

The International Union for the Conservation of Nature and Natural Resources (IUCN) is an international organization established to protect natural resources (Anon, 2018e).

Alignment with IUCN's categories, adhering to international conventions, and developing relations with international organizations are necessary. IUCN lists nature conservation areas under six categories. The recommended statuses for these categories in Turkey are as follows:
Category 1 "Absolute Nature Reserve - Nature Conservation Area and Wild Area - Wild Life Area under Strict Conservation",
Category 2 "Ecosystem Conservation and Recreation",
Category 3 "Conservation of Private Nature Elements",
Category 4 "Habitat (Biotope) / Species Conservation Area",
Category 5 "Marine and Land Landscape Conservation and Recreation", and
Category 6 "Sustainable Use of Natural Assets" (Dudley, 2008).

3.2. Protected areas in Turkey

The protected areas of Turkey include natural ecosystems ranging from deep valleys and canyons to glaciers, from deltas to forests and highlands of Black Sea, from seas and coasts to Mount Ağrı, from steppes to lakes and streams. Protected areas are home to many endemic, endangered and narrowly distributed plant and animal species. Moreover, these areas include natural beauties and areas with a variety of ecological, geological, historical, geomorphologic, archaeological, landscape and cultural features. Turkey is seen as a bridge and junction point in terms of its biodiversity as well as its historical and social features. It has rich biodiversity as it is the intersection point of three (EuroSiberian, Mediterranean, and Irano-Turanian) of 37 different phytogeographic zones on the Earth. Moreover, three (the Caucasus, the Mediterranean, Irano-Anatolian) of the world's 34 hot spots rich in biodiversity, which must be protected

immediately, are located in Turkey. With this feature, Turkey is one of the three countries (the others being China and South Africa) with three hot spots, and with its endemic species, it is seen as one of the most important countries in terms of biodiversity (Anon. 2017).

Turkey is one of the few countries that have been able to maintain a significant portion of its forests, wildlife species, and natural areas. Wild species which can be maintained only through special measures and various techniques in some countries, continue to exist naturally in Turkey lands today. The areas that host wildlife such as forests are also important biological production areas of Turkey. Forests are home to many species of plants and animals, including valuable prey animals, water birds, and fish species. In addition to their biodiversity conservation functions, these areas also have socioeconomic potentials (serving the welfare of the community) through activities such as hunting, recreation, reed production, grazing, fishing, etc. (Anon. 2005).

According to the official sources of the General Directorate of Nature Conservation and National Parks, protected areas are geographic areas defined and managed by legislation to ensure long-term preservation and sustainability of ecosystem services and cultural values with nature. Areas with protected area status in Turkey were determined under the Law No. 2873 on National Parks dated 28.08.1983 and under the Law No. 4915 on Land Hunting (Anon. 2018a).

3.2.1. Values of protected areas in Turkey

The study, which was conducted by GDNCNP in 2012 within the scope of Turkey's Protected Areas Information System project, determined the magnitude of the terrestrial protected areas of Turkey as 5 million 647 thousand 568 hectares (ha). This data indicates that 7.24% of Turkey's terrestrial areas are under official protection (Anon. 2017).

With the addition of special environmental protection zones and natural protected areas to the protected areas starting from the end of 2013, the number of protected areas in Turkey increased from 1,760 to 3,049, and the size of the area reached 7 million 883 thousand 551 hectares. Thus, the ratio of protected areas on land and sea to the territory of the country has reached 10.11%. This ratio is around 13% in the world, indicating the need to increase the protected areas in Turkey. However, while the protected areas in Turkey are increasing, the decrease in biodiversity continues. For this reason, besides the rural development of protected areas, it is necessary to focus on nature conservation of these areas (Yildizbakan, 2015).

The protected areas of Turkey are listed in Table 3, taking into account the area type and protected area values (Anon. 2018a). These areas are determined by considering the criteria of aesthetics, science, nature conservation, and natural beauties.

Table 3. List of protected areas in Turkey

Type of Protected Area	Value of Protected Area	Number
National Park	National	44
Nature Conservation Area	National	30
Nature Park	National	247
Monument of Nature	National	114
Wildlife Development Area	National	81
Preservation Forest	National	58
Natural Archaeological Area	National	1273
Special Environmental Protection Zone	Regional	16
Ramsar Area	Global	14
Biosphere Reserve	Global	1
World Heritage Site	Global	11

In Turkey, the protected area categories identified by legal regulations (Laws no. 2873 and 6831, etc.) and their protection values are under the authority of the Ministry of Agriculture and Forestry and the Ministry of Environment and Urbanization. Table 4 shows the protected areas under the authority of both ministries and the protection values that these areas have (Arpa et al., 2016).

Table 4. Protected areas of Turkey and their values

Protected Areas Under the Authority and Responsibility of the Ministry of Agriculture and Forestry	Values of Protected Areas
National Park (IUCN-Category II)	National
Nature Conservation Area (IUCN-Category Ia)	National
Nature Park (IUCN-Category V)	National
Monument of Nature (IUCN-Category III)	National
Wildlife Development Area (IUCN-Category IV)	National
Preservation Forest (IUCN-Category IV)	National
Ramsar Area (IUCN-Category IV)	National and Global
Biosphere Reserve	Global
World Heritage Site	Global
Gene Conservation Forest (in-situ)(IUCN-CategoryIV)	National
Seed Stand (in-situ) (IUCN-Category IV)	National
Seed Garden (ex-situ) (IUCN-Category IV)	National
Protected Areas Under the Authority and Responsibility of the Ministry of Environment and Urbanization	**Values of Protected Areas**
Special Environmental Protection Zone	Regional
Natural Archaeological Area	National
Natural Assets: Monumental Tree, Cave	National

3.2.2. International conventions to which Turkey is a party

Protected areas are the main building blocks of almost all national and international protection strategies supported by conventions such as the Biodiversity Convention. Protected areas cover 10% of the terrestrial areas of the world and rapidly increase in marine areas. The management objectives of the protected areas have a wide range: they should not be managed by one organization but can only be managed by many stakeholders (Dudley, 2008).

The areas that have been given the status of protected areas by the national laws in Turkey until now include national parks, nature conservation areas, natural parks, natural monuments, protected forests, gene conservation forests, seed stands, seed gardens, resting places in forests, wildlife conservation areas, wildlife development sites, aquaculture production sites, and natural sites as well as those with international importance such as world cultural and natural heritage sites, emerald network areas, and special environmental protection zones (Baskaya et al., 2005). The national and international biodiversity conventions to which Turkey is a party are shown in Table 5 (Anon, 2018c).

Table 5. International biodiversity conventions to which Turkey is a party

Title of Convention	Date of Convention/Publication	Turkey's Date of Ratification
Conservation of European Wildlife and Natural Habitats (Bern)	1982	1984
Convention on Biological Diversity United Nations	1992	1996
Cartagena Biosafety Protocol	2003	2004
The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	1973	1996
Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona)	1976	2002
World Charter For Nature	1982	1982
Stockholm Convention on Persistent Organic Pollutants	2004	2010

Forest Europe	1990	1990
Convention on the Protection of the Black Sea Against Pollution (Bucharest)	1992	1994
Convention on Wetlands (Ramsar)	1975	1994
Sevilla Convention	1971	1971
International Convention for the Protection of Birds (Paris)	1950	1956
Natura 2000	The EU Birds Directives (1981) / the EU Habitats Directives (1992)	

3.3. Studies on biodiversity

The most recent project on biodiversity studies in Turkey is Noah's Ark National Biodiversity Database. The details of this project are explained under "principles of benefiting from the project.".

3.3.1. Noah's Ark National Biodiversity Database

Many projects are in progress in Turkey on biodiversity conservation. Among these, "Noah's Ark National Biodiversity Database" has national and international significance. Therefore, the purpose and scope of this project and the principles of benefiting from the project are explained in detail in this study.

In addition to the GDNCNP information system to combat bio-smuggling and the projects and studies that we have listed in Table 1, Noah's Ark National Biodiversity Database was established, which contains observation data of the species in the biogeography of Turkey. It is an Internet-based national biodiversity database that is open to data entry by all researchers (Anon. 2018).

The purpose and scope of this project are explained in detail below under the "Principles of Benefiting from the Project."

3.3.1.1. Principles of benefiting from the Project

Wildlife management is based on protecting the natural process. Protection is required for all wildlife species that are hunted and not hunted. For this purpose, it is aimed to preserve genetic diversity and ecosystem by considering all species. Wildlife management aims to ensure the protection and development of areas of endemic species under the threat of extinction nationally, locally or culturally - economically valuable species (Gungoroglu, 2000).

The following can contribute to Noah's Ark National Biodiversity Database (Anon. 2018);

1. All public bodies,
2. Scientists and academic research units,
3. Non-governmental organizations collecting data on the nature of Turkey,
4. Other institutions with a biodiversity database,
5. Amateur observers.

The concept of "biosphere reserve," which has most recently been introduced, refers to protected areas where the principle of both protection and use is applied (Albayrak, 2010). There is no data on the number of prey animals or hunters in Turkey. Moreover, it is not known how many prey animals hunters hunt every year either. Therefore, we need to investigate how it would be possible to protect and manage animals whose number is unknown. As a practical solution, the inventory of prey animals should be immediately taken, and hunting should be carried out within the framework of laws. The first step in ensuring sustainable wildlife management is the wildlife inventory (Kucukosmanoglu and Arslangundogdu, 2009).

Noah's Ark National Biological Diversity Database was created by the Biological Diversity Monitoring Unit of the Ministry of Forestry and Water Affairs of the Republic of Turkey, on 18.10.2007. Today, many species live in the wild in Anatolia. Noah's Ark National Biodiversity Database was created by scientists to maintain the richness of wildlife, one of the most important natural resources of Turkey, and to contribute to the studies on nature.

It is the most extensive national database with the .gov extension where data on Turkey's biodiversity is collected, questioned and monitored (Anon, 2018). .gov is the top-level domain name on the internet. It is the abbreviation of the word

"government" in English. This database ensures the following:

• Conservation of biodiversity, one of Turkey's most abundant natural resources, is a long-term investment for future generations and ensures the protection of Turkey's natural resources.

• Turkey's obligations arising from international processes such as the United Nations Convention on Biological Diversity and Accession to the European Union (EU) are fulfilled.

Noah's Ark National Biodiversity Database is a publicly available, web-based database that gives its members limited access to data and permits interrogation based on "areas," "species," and "habitats" for monitoring Turkey's biodiversity (Anon, 2018). Thus, users will be able to;

• Enter into the system their data on biological diversity directly through the location coordinates without depending on field names,

• Filter information on the family, taxon, and time interval based on species and information on protected area, habitat, and geographical area by indicating the area on the map,

• Access to the distribution of species maps,

• Follow the changes in the species in the red list status,

• Follow all protected areas and changes in protected areas over time,

• Use the database when preparing Environmental Impact Assessment (EIA) reports and making critical managerial decisions.

4. Conclusion and Recommendations

The explanations and investigation of researches so far can be summarized as follows.

1- To protect the biodiversity in Turkey, it is necessary to prevent the adverse effects of living and non-living factors. Biological diversity must be ensured by taking these various protective measures.

2- EIA should be carried out for any type of buildings or facilities that are planned in areas where biodiversity is protected. While preparing EIA and making important managerial decisions, Noah's Ark National Biodiversity Database can easily be used.

3- Natural resources should not be polluted and damaged during the biodiversity protection activities.

4- The conservation of biodiversity requires public participation and cooperation. This is possible by educating the public and raising awareness. Conservation of natural resources should not mean that they are kept untouched; it can be achieved by using resources wisely. Successful and effective conservation is possible through participation, mutual understanding and consensus. Conservation efforts should be supported by social and economic measures.

5- For the realization of activities related to nature conservation, the contribution of the state as well as other private and legal entities is essential.

6- The effects of global climate change should be examined throughout Turkey and risk areas should be determined through data banks such as Noah's Ark National Biodiversity Database.

7- The developed countries of the 21st century do not only use their natural resources (forests, wild animals, plant species, water resources, etc.) financially; they consider their sentimental values and strive to protect them.

8- Turkey must be a member of all international organizations on the conservation of nature and natural resources around the world and fulfill their requirements.

9- Turkey must fulfill its obligations arising from international processes such as the United Nations Convention on Biological Diversity and Accession to the European Union.

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