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# The Importance of Biosphere Reserve in Nature Protection and the Situation in Turkey

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## 1. Introduction

“Preservation” implies keeping things as they are, and “protection” implies keeping outside interference at bay. “Reservation” involving refuges, reserves and sanctuaries, aims to avoid use or exploitation of an area and ‘zoning’ or ‘segregation’ seeks multipurpose use by careful management of resources. “Conservation” in its modern sense is a broader concept, comprehending all of these limited approaches and more (Evans, 1997). According to another description, the concept of conservation is a set of precautions which are needed for the sustainability of life and are developed in order to prevent the extinction of future resources by determining optimum usage methods (Gul& Sahin, 2010).

Today environmental problems have reached to an alarming level and this has drawn strong attention to the subject of “protection and sustainable usage of environmental resources” which has been on the agenda for a long period of time. Besides being a common problem for all the nations of the world, this problem has become the common policy of their governments.

Irresponsible use of natural resources and destruction of natural factors on the Earth are not something new. Therefore, the precautions that are taken to protect nature are not new as well (Yucel, 1995). The notion of modern protection started to develop at the beginning of 1800s and ‘Nature Protection’ was accepted as a discipline in 1900s (Zeydanli, 2008). However, by the 21<sup>st</sup> century efforts for the protection of nature have a significant rising tendency in global scale (Yalinkilic&Arpa, 2005). Although the actions taken for protecting nature vary partially from country to country, the common problem is that the protected areas cannot be managed effectively due to several reasons, including the variation in the physical size of the areas. The main reason of the problem is the disagreement between the human use in the area and the conservation of natural and cultural values. It has been realized that the reason of the failure in the efforts of protection in protected areas was at the point of avoiding the local residents. Therefore, integration of the local people with the protection efforts is required. Over the last few decades, the participation-paradigm has grown in research, policy, and practice of natural resource management, biodiversity conservation, and stewardship of ecosystem services

(Schultz et al., 2010). One of the points of view emerged from the participation of local communities to the management process of the protected areas is the holistic approach. For most of the local communities, the most important purpose of the protected area management is to provide the continuity of their lifestyles and cultural heritage. The protection of biological diversity is a component of the mentioned purpose, it does not constitute a purpose on its own. Within this context, "Human and the Biosphere" Programme of UNESCO is extremely important because it is the first environmental program which targets the relationship of the human and the nature. In 1984, MAB ICC approved the concept "Human is a part of biosphere reserve" in "Action Plan for Biosphere Reserve Areas". At the same time, while describing a biosphere reserve area and its management, the importance of local residents and their socio-economic development is included in the description (Price et al., 1998). Participation and cooperation have been increasingly emphasized in the discussions concerning biosphere reserves (Kleeman&Welp, 2008). In fact, this cooperation becomes more meaningful in "transboundary biosphere reserves". "Transboundary Biosphere Reserve Areas" have support in functions like promoting peace, protecting and managing resources and the environment, preserving and enhancing cultural values and especially protecting transboundary people, in addition to the three functions of classic biosphere reserve areas. Moreover, sharing the same "Transboundary Biosphere Reserve Area" can be helpful for building up trust and peace among neighbouring countries (Corn, 1993).

As can be seen, the role of Biosphere reserves in nature protection is unique and important.

## 2. What is a biosphere reserve?

Biosphere reserves are sites established by countries and recognized under UNESCO's "Human and the Biosphere" (MAB) Programme to promote sustainable development based on local community efforts and sound science. As places that seek to reconcile conservation of biological and cultural diversity and economic and social development through partnerships between people and nature, they are ideal to test and demonstrate innovative approaches to sustainable development from local to international scales. For achieving the three interconnected functions: conservation, development and logistic support, each biosphere reserve must contain three connected zones (Unesco, 2011).

The zonation scheme, with the three zones, is the landmark and the identity of biosphere reserves and is recognized as such (Cibien&Jardin, 2007). These zones are called "the core zone, the buffer zone and the transition/development zone" (Fig. 1). The functions of these zones are going to be explained below.

Core zone can be one or more in number. It is a securely protected site for conserving biological diversity, monitoring minimally disturbed ecosystems and undertaking non-destructive research and other low-impact uses (such as education); buffer zone is the part which usually surrounds or adjoins the core area, and is used for co-operative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism and applied and basic research; and a flexible transition/development zone, or area of co-operation, is the part which may contain a diversity of agricultural activities, settlements and other uses and in which local communities, management agencies,

scientists, non-governmental organizations, cultural groups, economic interests and other stakeholders work together to manage and sustainably develop the area's resources (Unesco, 1996).

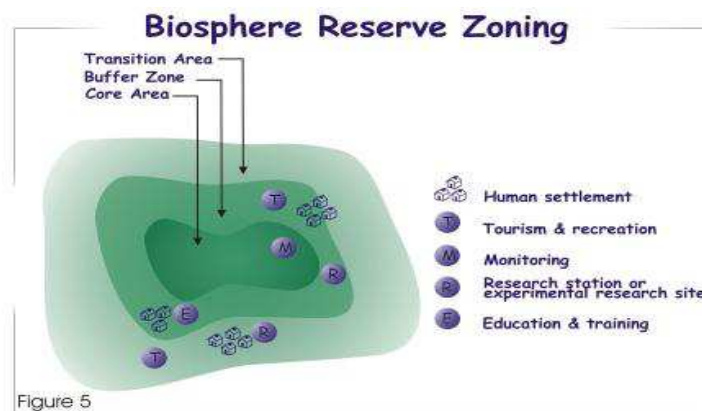


Fig. 1. Biosphere reserve zoning scheme

### 3. The difference of biosphere reserve in the concept of nature protection

Protected areas exist in almost all countries. Most of these areas were determined throughout 20<sup>th</sup> century and announced officially and this is accepted as "the largest scaled, logical land use change made by human" throughout history (Dudley et al., 2005).

Today the International Union for Conservation of Nature (IUCN) determines the fundamental policies and systems for conserving nature and IUCN defines a protected area as "an area of land and/or sea especially dedicated to the protection of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means". According to "1978-Protected Area Classification of IUCN" Biosphere reserves were in the status of protected areas, later on in 1994 they were removed from this status, but were transformed into a state of area which has international importance including other categories, as well (IUCN, 1994). At first sight, there seems to be slight differences between biosphere reserve areas and other areas with conservation status. However, management purposes and expected functions of these areas are rather different (Zal et al., 2006). The differences are indicated in Table 1.

Nature conservation is often understood to occur only within the limited boundaries of protected areas, managed by government agencies. These are conceived as islands of conservation where any form of human intervention is considered harmful for conservation. In contrast to this model, yet complementing its very cause, are thousands of 'unofficial' protected areas across the globe, managed and sustained by ordinary people. In fact, indigenous, mobile, and local communities have played a critical role in conserving a diversity of natural environments and species for millennia, for various economic, cultural, spiritual and aesthetic purposes (Pathak et al, n.d). At this point, the difference of biosphere areas becomes clear with the fact that they do not ignore "human" factor. Today, national parks in many countries increasingly reflect the objectives of biosphere reserves--more cooperation among adjacent land managers, more local involvement, more emphasis on the role of research and public education (Gregg, 1989).

Protected Areas	Biosphere Reserves
- One type of land, a single category of land, usually relatively small in size and managed for a single purpose (e.g. nature conservation)	-A mosaic of different types of land several categories of lands, generally managed for different purposes (e.g. conservation, development, etc.)
-One type of purpose and function Conservation	-Harmonization of different types of purposes and functions Conservation, development, logistical support
-One main category of interests Natural, Landscape,Cultural,Historical	-Multitude of interests often conflicting: farming, forestry, fisheries, tourism, science, local and national government
-One manager well identified, directly in charge of the management of the territory	-Several managers working more or less independently without consultation
-Simple zonation	-Complex zonation three zones, transition/development area without demarcated outer limit
-Protection through regulation	-Various means of protection Regulation limited to the core areas, existence of management agreements or contracts
-Management plan single planning scenario applied to a well- defined land area	-Guide to Biosphere Reserve coordination harmonisation of different planning scenarios for different areas in line with Biosphere Reserve concept; emphasis on local participation
-Single ecosystem approach populations, ecosystem functioning	-Landscape approach complex of ecosystems
Manager	Coordinator

Table 1. Differences between Protected Areas and Biosphere Reserve (Bioret 2001)

4. Biosphere reserve action in Turkey

Turkey is located at the point where the continents Asia, Europe and Africa meet. Therefore, it is endowed with a rich biodiversity which makes it unique on European and World scale

(Keskin&Sarac, 2008). Furthermore, since Anatolia has hosted numerous civilizations for ages, it has a unique and rich cultural heritage.

Forest Law and Land Hunting Law are the first laws related with the nature conservation that came into force in 1937. However, “Nature Conservation and National Park” concept which firstly entered the agenda of Turkey in 1948 by scientific studies could exist in a law with the revised Forest Law in 1956 and turned out to be an application (Kaplan, 2003).

In Table 2. the status of protected natural and cultural resources/ areas in Turkey are shown in accordance with their current legal basis. With a new regulation of law on August 17, 2011, the authority related with the determination, registration, announcement and management of National Parks, Natural Sites, Nature Protection Areas, Natural Monuments, Natural Parks, Wetland Areas, Private Nature Protection Areas and other areas with protection status is conveyed to Special Environmental Protection Agency of Ministry of Environment (Special Environmental Protection Agency, 2011).

Protected Areas	Legal Basis
National Park, Nature Protection Area, Natural Monument and Natural Park	Natural Parks Law
Wildlife Protection Area, Wildlife Development Area	Land Hunting Law
Protection Forests, Gene Protection Forests, Seed Stands, and Inner Forest Resting Places	Forest Law
Natural Sites	Cultural and Natural Heritage Protection Law
Aquaculture Production Areas	Aquaculture Law
World Heritage Areas, Private Nature Protection Areas, Emerald Network Areas, Wetland Areas/Ramsar Areas, Biosphere Reserve and Nature 2000	International Agreements

Table 2. Legal Structure of Protected Areas In Turkey

In spite of all these protection status, unfortunately the reality of losing natural and cultural diversity all around the world and especially in developing countries is also valid for Turkey as well. Main reason of this situation is the disagreement between the rules and the human use in the protected area. However, if biosphere reserve area approach is applied to the protected area and its surroundings, it seems to be an effective solution in protection by balancing the usage.

Camili (Macahel) Biosphere Reserve Area which is officially approved in 2005 is the one and only Biosphere Reserve Area in Turkey for now. On the other hand, “Project of Protection and Sustainable Development of Biological Diversity and Natural Resources in Yildiz Mountains” is being carried out with biosphere reserve approach by General Directorate of





Coastal areas of the peninsula are 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Level Natural Sites. 1<sup>st</sup> Level Natural Sites are the areas which must be protected as they are in terms of public weal because they have universal values in terms of scientific protection and they have interesting properties and beauties which are rare. 2<sup>nd</sup> Level Natural Sites are defined as areas which can be put into service by considering public weal besides protection and development of the natural structure. 3<sup>rd</sup> Level Natural Sites are defined as areas which can be opened to housing by considering the region's potential and land use features in the way of protection and development of the natural structure (Gul&Sahin, 2010). 61 km<sup>2</sup> of the peninsula is in the 1<sup>st</sup> Level Natural Sites Category, an area of 3,9 km<sup>2</sup> is in the 2<sup>nd</sup> Level Natural Sites Category and 5,3 km<sup>2</sup> of the peninsula is considered in the 3<sup>rd</sup> Level Natural Sites Category. Black Island in Gerence Bay was registered as Wildlife Protection Area in 1994 besides being in the 1<sup>st</sup> Level Natural Sites Category.

Wildlife Protection Areas are defined as the areas which have wildlife values and which are absolutely protected with their plants and animal species and their continuity is provided (Ministry of Forest and Water Works, 2011). Ministry of Agriculture and Rural Affairs General Directorate of Protection Control prohibited the fishery activities down to 20m depth from the coast, in the area between Ardic Headland and Ege University Control Station in Mordogan District (except the sedimentation fishery area which is active in Ayibaligi Location) (Sad-Afag, 2011). (Figure 3)

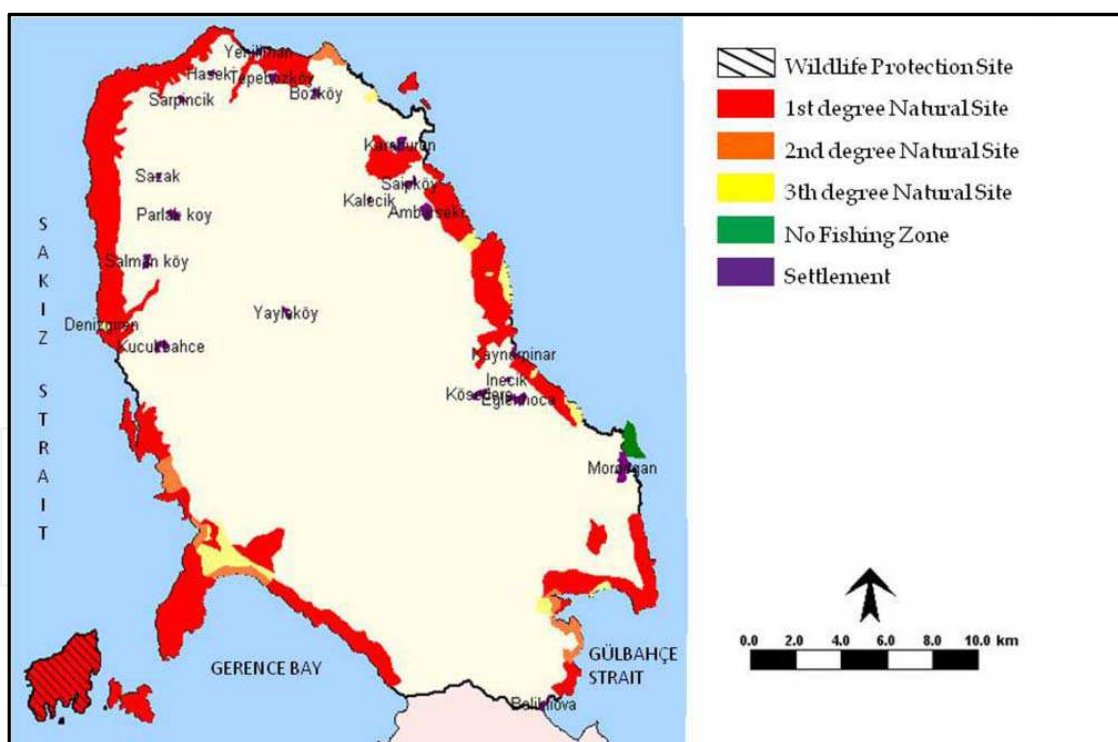


Fig. 3. Protected Areas

Although the area is protected with “protection status” like “Natural Site, Wildlife Protection Site” and with a special regulation for Mediterranean Monk Seals which is called “No Fishing Zone”, threats against nature and cultural structure of the area are increasingly continuing.



The most important threat of all is the “population migration”. Local residents of the peninsula, especially the young people leave where they live and go to big cities for better facilities in business and a better life. This causes the area to be abandoned and brings the loss of local values. Another important problem for the area is the unplanned second house building activity. These houses are only used in summer and the increase in number threatens the wildlife and the flora of the peninsula. This activity is dense especially on the eastern coast but it is rare on the western coast. This observation seems to be the messenger of a future increase in housing. According to a research; it is understood that there were about 3.500 second houses on the peninsula in 1990. In 2002 the number of the houses increased up to 10.000. After applying Trend Analysis Method to the increase between 1990 and 2002, it is estimated that the number of second houses will be about 74.000 in 2020 (Nurlu et al., 2002). Despite having limited plantation areas because of the rough land formation of the peninsula, agricultural activities are still the primary means of living here. Unfortunately, the increase in number of second houses means a big problem for the agriculture sector. A lot of fertile fields that are cultivable are under the risk of second house invasion.

In addition, serious attempts are needed to re-discover the viticulture and olive production for the economy of the peninsula because the areas that are used to grow quality grapes are no longer in use. Today these areas are about to be lost completely. Since these areas are not in agricultural use, the danger of second house invasion is on the way. Another threatening factor for the flora of the area is the uncontrolled goat feeding. Due to having a few meadows which are not enough for feeding goats, these animals can cause much destruction to the land and threaten the native plants and animal species. On the other hand, marble and mercury mining activities are continuing on the peninsula. Consequently, the waste products coming out of the mines are damaging the agricultural areas and the flora, together with the mountainous habitat. Similarly, wilful fire raising for having lands for agriculture or for building second houses is threatening the natural flora and the wildlife of the peninsula. Moreover, increasing fish farming activities in the bays of the peninsula which have inefficient water circulation is not only another threatening factor for the coastal and underwater flora and fauna of the peninsula but also a warning for the man-kind to rescue the currently clean coasts and sea before becoming polluted in the future.

In 2007, in a written notice of Ministry of Environment and Forest, it is declared that “Due to the necessity of protection, fish farms cannot be established in closed bays and gulfs which have delicate area qualifications”. Despite this fact, fish farming activities are increasing.

Additionally, Mediterranean Monk Seals attack fishermen’s nets just to feed themselves but this instinctive natural behaviour causes fishermen to harm the seals.

Consequently, Karaburun Peninsula carries the potential of being a biosphere reserve area because it is an area where human interference to nature is minimal, it is an important place in terms of bio-diversity, it has facilities to be a model for sustainable development efforts in regional scale and its area is big enough to perform the three fundamental functions of a biosphere reserve (Table 3).

Karaburun Peninsula	
Protection	It is a living and breeding area for Mediterranean Monk Seals which are important in international scale. At the same time, it is an important area for several bird and plant species which are important in International and European scale.
Development	It is an area that agriculture, livestock, fishery and tourism activities can be held. It is an area open to its traditional production, in the area daffodil and hyacinth agriculture and olive production can be made. Viticulture which is now almost extinct can be re-discovered .
Logistic Support	It enables local people to become conscious by scientific socio-economic research and observations.

Table 3. Potential function capacity of Karaburun Peninsula biosphere reserve area

5.1 Materials and method

In the research; 1/25.000 scaled Topographical Map Sections of Karaburun Peninsula, Sections of Environmental Landscape Revision Plan and Aster Satellite images with 15 m resolution, dated May 2005 are used. Moreover, Quickbird satellite image provided by Google Earth has been evaluated in certain points in order to enable the decision process in the phase of interpretation of Aster Satellite image. Seal Observation Records (1997-2002) which belong to Karaburun Peninsula by Underwater Research Society-Mediterranean Monk Seal Research Group, birdwatching records kept by Ege University Birdwatching Community and shared by Turkish National Bird Databank, Kusbank (2003-2004) are among our resource materials.

In the research, in the process of data transfer to the computers and its assessment; software GeoMedia Professional 4.0, Map Info 7.0 of GIS and in the stage of satellite image processing Image-Analyst and Microstation 95 software are used. In land studies topographical data is collected via GPS.

In biosphere reserve zoning; wildlife (Mediterranean Monk Seals and birds), vegetation, current land use and protected areas are taken as the base.

By using the Mediterranean Monk Seal observation record data of “Community of Underwater Research-Mediterranean Monk Seal Research Group”, two maps “Seal Observation Map” and “The Map of Breeding Caves and Cavities for Mediterranean Monk Seals” are developed. The records of Karaburun Peninsula Bird Atlas Studies are divided into categories according to SPEC (Species of European Conservation Concern). Based on these records, the Map indicating the breeding areas of Audouin’s Gull which is included in Spec 1 category and important in global scale is formed; mapping according to Spec categories is realized and Maps related with the Existence of Raptors and The Richness of Species in Bird Existence are developed. Vegetation formation and vegetation intensity of the research area is composed with the studies on Aster satellite images of May 2005 and on land observations.

In the determination of vegetation intensity, NDVI (Normalized Difference Vegetation Index) which is the assessment of plant reflections in nature is applied. By considering the land covering rate of vegetation with controlled classification, five different classifications are made as Very Intense (100%-80%), Intense (80%-60%), Poorly Intense (60%-40%), Very Poorly Intense (40%-20%) and Bare Rock (20%-0%) and Vegetation Intensity Map is formed.

Furthermore, Vegetation Formation Map is formed by determining six different groups of areas as Forest, Afforestation Area, Maquias-Forest, Maquias, Frigana and Bare Area. By the help of thematic maps formed in GIS environment, regions were determined by using single layer, multi layer inquiries and overlaying.

## 5.2 Findings

### 5.2.1 Land use

In spite of its extremely rough topography, agricultural activities have always maintained its priority in the economic structure of Karaburun Peninsula. Especially grape and olive production has been important in agricultural activities since ancient ages. Selecting these two products which have the best harmony with the soil and climate conditions and building terraces on the slopes for the prevention of erosion and minimization of soil loss have always increased the importance of agricultural activities, especially viticulture and olive production, in the peninsula. After the population exchange between Greece and Turkey (1923), by the departure of Greeks from the peninsula, the gap in the agricultural production is tried to be filled by the settlement of immigrants but this could not prevent the quick collapse of the agricultural structure (Isik, 2002). Vineyard areas which used to be 65.500 da in 1926 are very limited narrow areas today (Isik, 2002). Most of the vineyard areas today lie idle. The origin of worldwide known "Sultana Seedless Grapes" is Karaburun Peninsula. Besides "Sultana Grape", "Hurma Olive" is an olive species peculiar to Karaburun. Olive oil production in small scale local factories is the most essential and still up-to-date alternative means of earning a living for the local people (Erdem et al., 2001). Other important agricultural products of the peninsula are artichoke and tangerine. The fact that artichoke occupies 77% of the total vegetation area implies the importance of this product for the peninsula. Another agricultural activity which has been important in the recent years is daffodil cultivation. Grown daffodil and hyacinth are directly sent to Istanbul and Ankara and make a great economic contribution to Karaburun (Karaburun Municipality, 2011).

Since the meadowy areas are limited in Karaburun Peninsula, livestock hasn't developed much. In contrast, the number of goats is high related with the rough land of the peninsula. Yayla Village which is in the middle of the peninsula has the most livestock activities. Again the village has the most of goats; dairy and cheese production are the main sources of income (Isik, 2002).

Fishery is among important sources of income for the residents of Karaburun. The most famous fish of the region are grey mullets and red mullets. However, because of the fishery activities of high capacity fishing vessels coming from the Black Sea (some of which poach fish very close to the coast), fishermen of the region who fish amateurishly suffer much (Karaburun Municipality, 2011). In addition, fish farms are located to coves and bays of the peninsula.

Aegean and Mediterranean Coasts are very attractive in terms of tourism and especially in summer season they are intensely used. Although Karaburun is on the Aegean Coast, it hasn't been popular touristically. Just because of this reason, Karaburun has protected its natural features until now.

Narrow and crooked roads to Karaburun Peninsula are the most important factor that delays the potential of the area in terms of tourism. Also Karaburun Peninsula serves to domestic tourism more than foreign travel. Domestic tourism mostly consists of the usage of people who come from and around İzmir.

### 5.2.2 Wildlife

Mediterranean Monk Seals prefer quiet and deserted coasts which people cannot reach easily and no housing exists. Their living area must be away from human activities. Caves and cavities which function as breeding and/or sheltering areas are suitable for them (Kırac&Guçlusoy, 2008). After the assessment of the data related with the observation records and living-breeding areas of Mediterranean Monk Seals; it has been understood that the areas Mediterranean Monk Seals have been seen are surprisingly the eastern coasts of the peninsula where the human-settlement is dense (Fig. 4). Since coastal caves and cavities are mostly in the eastern side of the peninsula and indispensable for breeding of Mediterranean Monk Seals, these animals prefer the eastern coasts that housing and second house settlement is dense.

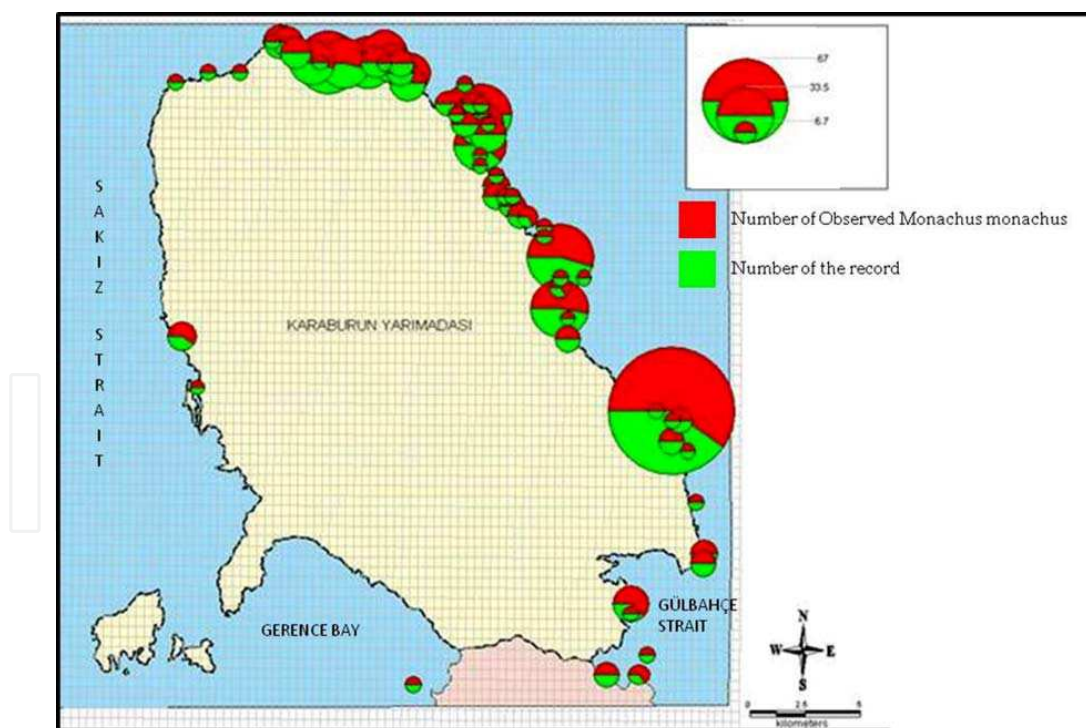


Fig. 4. *Monachus monachus* observation map

It is certain that there are not many observation records of the western part of the peninsula but this does not mean that western coastal areas are not used by seals or these parts are unimportant. There are not so many houses and settlements in the western coast. Therefore,



the observation records are formed by the statements of comparatively few residents of the region or the fishermen. In other words, less population means less observation reports. On the contrary, cliffs in the western coasts of the peninsula include appropriate places for the seals to stroll around and have a rest. There are eleven breeding caves and cavities in the peninsula. In three of these caves, definite breeding records have been seen. Two of them are in the northern coast of the peninsula and both are in 1<sup>st</sup> Level Natural Sites. The other one which is the most important breeding cave is in “Mordoğan-Ayıbalığı Location” and away from protection with intensive human use (Fig.5). In order to protect this cave, the sea region which surrounds the cave is announced as “No Fishing Zone” by the General Directorate of Protection and Control. Even if no breeding record is seen in other caves and cavities, they have utmost importance because of being potential breeding caves. These caves are located in the 1<sup>st</sup> and 2<sup>nd</sup> Level Natural Sites. For breeding, feeding its pups and having a rest Mediterranean Monk Seal uses the land and for feeding and copulating it uses the sea. In providing protection to the living and reproduction areas, the sea is as important as the coastal land area. However, for a living creature which covers a distance of about 40 kilometres per day like the Mediterranean Monk Seal (Kirac&Guclusoy, 2008), it is hard to determine protection areas in the sea. On the other hand, the study about the diving behaviours of Mediterranean Monk Seals which is made by Dendrinios et al., (2007) has been a reference while determining the protection areas inside the sea. The study indicates that a Mediterranean Monk Seal can dive down to 40 m in the Aegean Sea even if it has diving records of 123 m.

Seals prefer quiet and restful cliffs and coasts away from human. However, second housing especially near the breeding caves of the seals (Fig.6), swimming activities of people where the breeding caves exist and the fishery activities cause the seals to leave these areas which are vital to them.

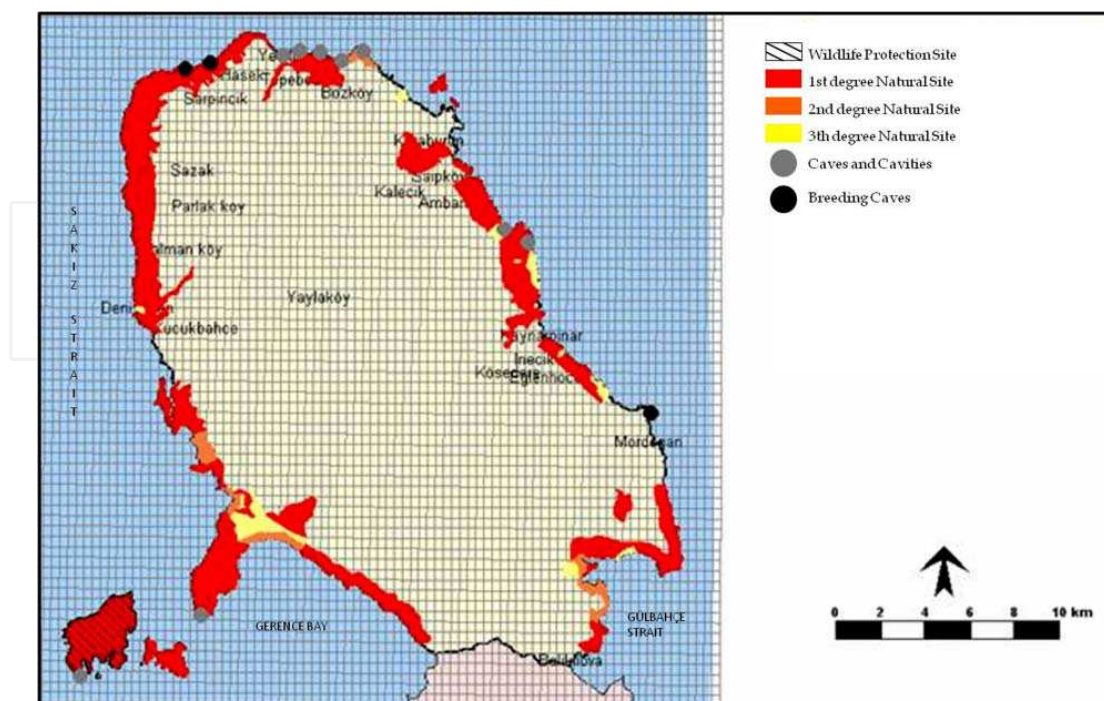


Fig. 5. Relationship of breeding caves and protected sites



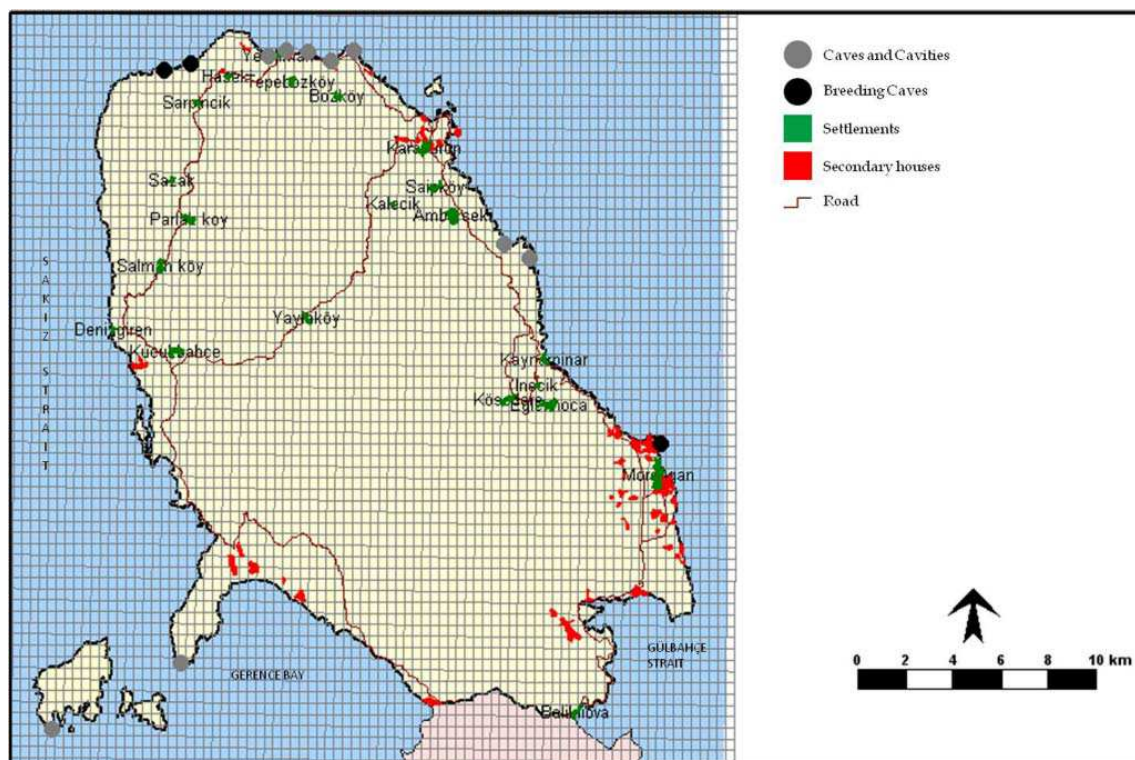


Fig. 6. Relationship of breeding caves and settlements

In accordance with the Bird Atlas studies carried out in the peninsula, 27 families and 67 species were detected. However, these studies were conducted with limited facilities by Aegean Wildlife Conservation Society so it is estimated that the real numbers are more than the reported. Audoin's Gulls (*Larus audouinii*) within Spec 1 category which has a protection priority in global scale are seen in palisades and offshore islands in colonies. In ovulation areas, they prefer medium flora. The ovulation period begins from the second half of April and continues until the beginning of May. In the first two weeks of July, pups hatch (Trakus, 2011). Big Island near Karaburun settlement and Blask Island in the southwest of the peninsula are known as the breeding areas of Audoin's Gulls (Fig.7).

The area is important for birds of prey at the same (Fig.8). Wild species such as Golden Eagle (*Aquila chrysaetos*), Short-Toes Snake Eagle (*Circus gallicus*), Eurasian Sparrowhawk (*Accipiter nisus*), Common Buzzard (*Buteo buteo*), Long Legged Buzzard (*Buteo rufinus*), Western March Harrier (*Circus aeruginosus*) exist in the area. Besides this, coordinate information pertaining to Eleonora's Falcon (*Falco eleonora*) is not given and it is not mapped in order not to pose a threat. However, it is stated by specialists that breeding records belonging to Eleonora's Falcon are no more seen in the area.

Richness of Species and diversity in a certain area is the indication of a healthy environment. Diversity of Species in terms of bird existence is divided into four categories between 1 and 22. According to the evaluation of the results, Iris Lagoon wetland region and Bozkoy and its surroundings are the areas that 15-22 and 10-15 species are seen (Fig.9). Iris Lagoon wetland and its surroundings where birds of Spec 2 and Spec 3 categories are intensely observed are very important. In other words, these areas are the priority areas for birds (Fig.10).

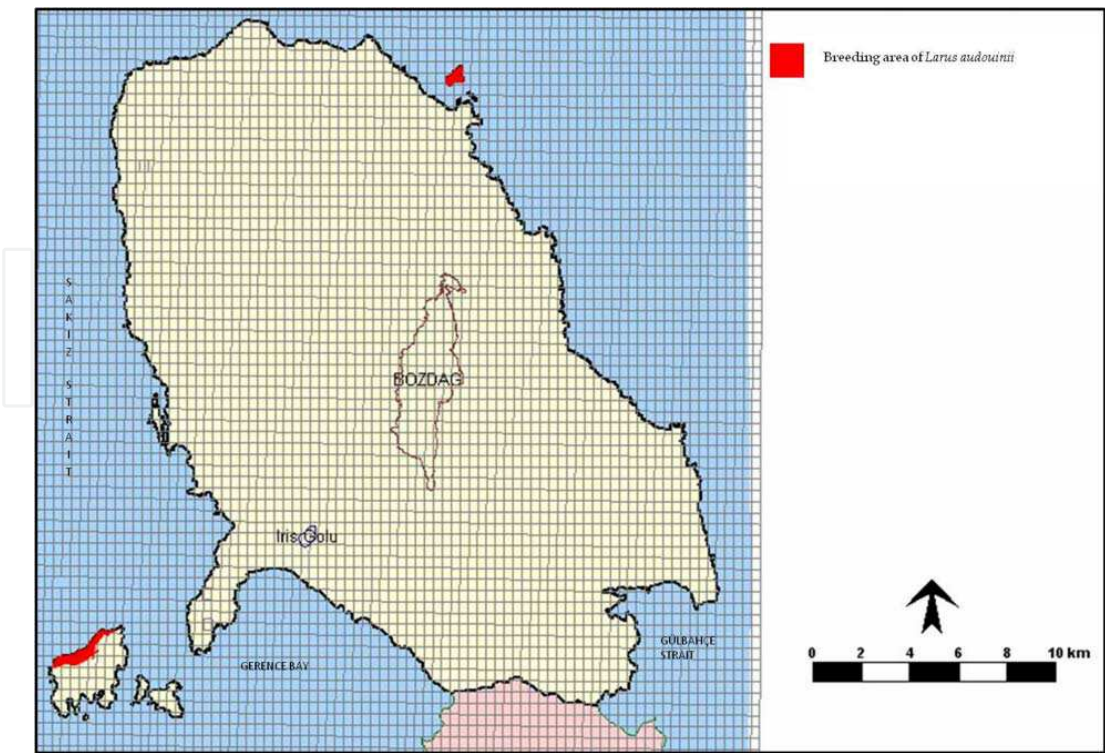


Fig. 7. Breeding area of *Larus audouinii*

The vicinity of Karaburun settlement to Big Island, intensity of human activities especially in summer and boat cruises to Black Island threaten the living and breeding areas of Audoin’s Gulls.

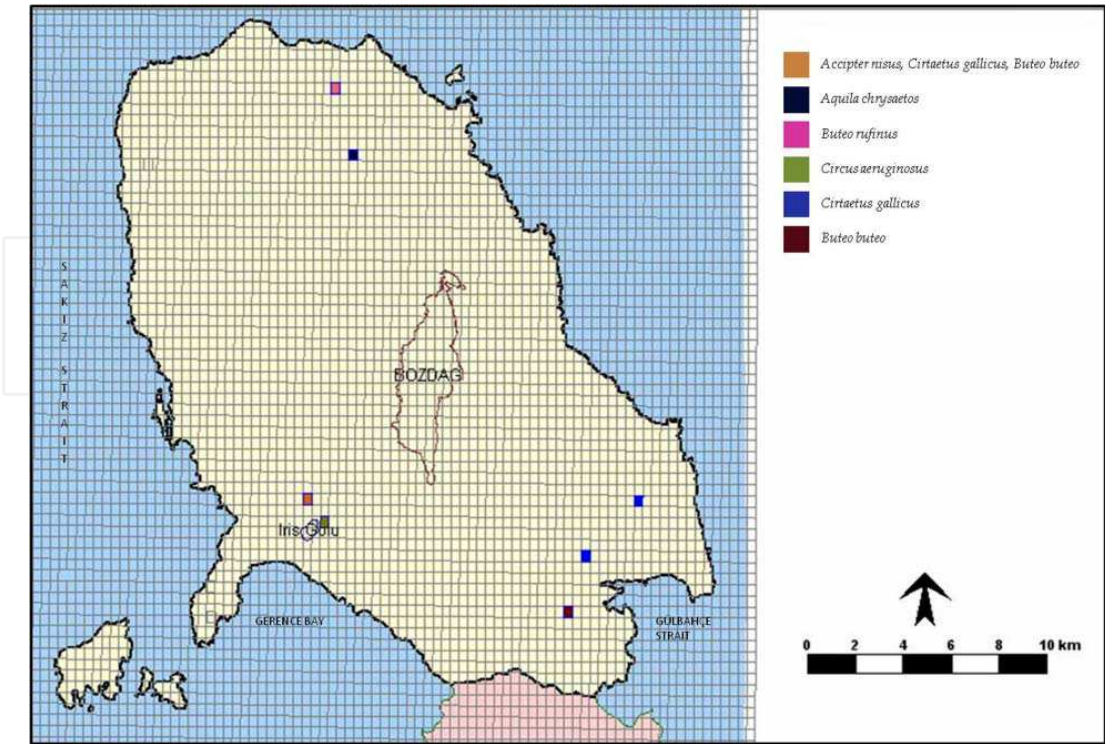


Fig. 8. Birds of prey



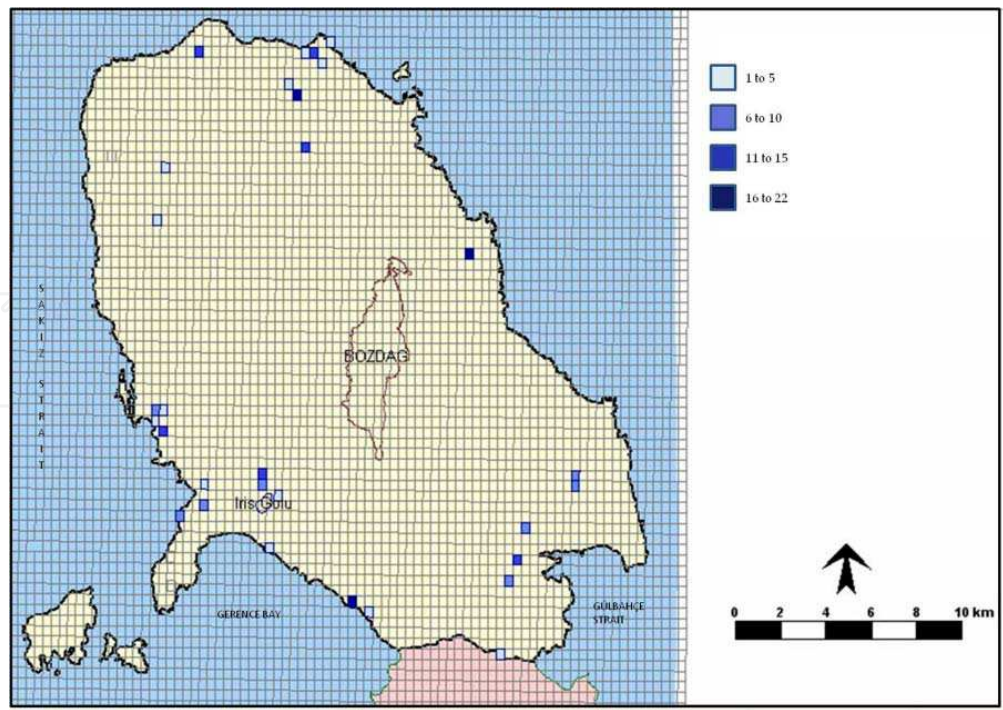


Fig. 9. Richness in species of birds

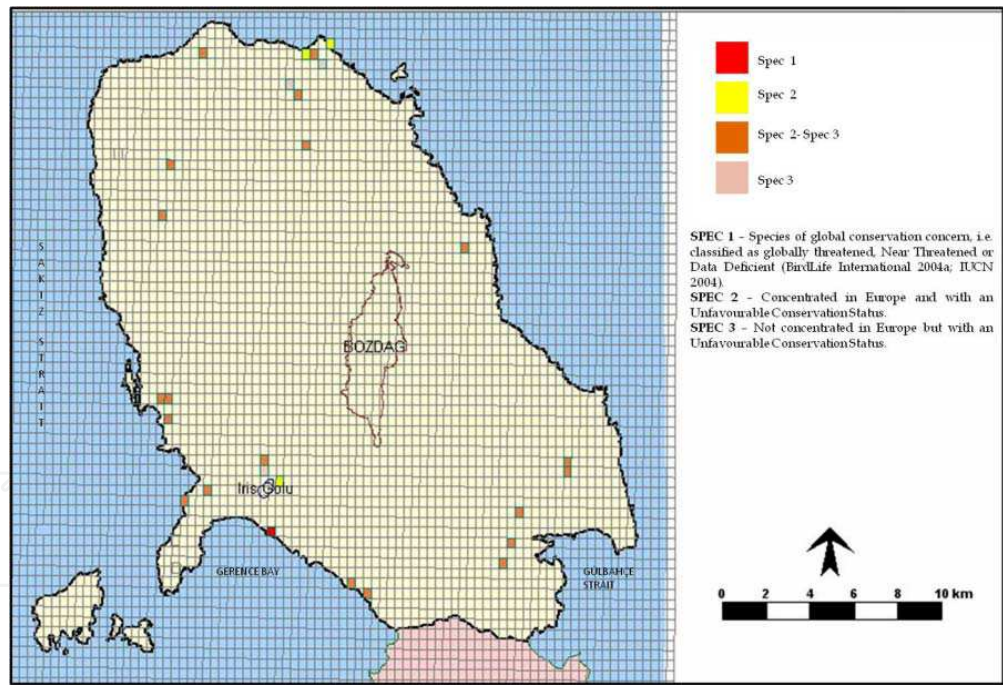


Fig. 10. Species of European Conservation Concern or SPEC

5.2.3 Vegetation

The area has the properties of typical Mediterranean vegetation geography. Vegetation formation is classified as Forest, Maquias, Maquias-Forest, Frigana, Meadow and Bare Area. The most spread vegetation formation in the area according to vegetation maps and field observations is “frigana” (Fig.11). Thorny Burnet (*Sarcopoterium spinosum*), Cistus species

(*Cistus sp.*) and Thymus species (*Origanus onites* ve *Thymbra spica*) are among the dominant species of frigana formation. Forest areas consist of natural forests and forests acquired with afforestation. Natural forests are formed of Mediterranean Pine (*Pinus brutia*) and exist in separated small groups for several reasons. In the afforestation areas, 80% East Mediterranean Pine (*Pinus brutia*), 10% Stone Pines (*Pinus pinea*) and 10% Cypresses (*Cupressus sp.*) are used. Another afforestation activity in the area is the olive afforestation. This afforestation activity is conducted under the control of the Ministry of Environment and Provincial Department of Environment and Forestry with the allocation of lands which belong to the Treasury to business concerns and the people.

What's more, Mastic (*Pistacia lentiscus*), Terebinth (*Pistacia terebintus*), Common Myrtle (*Myrtus communis*), Spanish Broom (*Spartium junceum*), Prickly Juniper (*Juniperus oxycedrus* var '*Macrocarpa*'), Greek Strawberry Tree (*Arbutus andrachne*) and Strawberry Tree (*Arbutus unedo*) can be listed among dominant species in maquias vegetation. In addition, there is Sweetbay (*Laurus nobilis*) in natural forests. They usually exist in natural forests on the northwest hillside of Bozdag. Natural existence of Sweetbay in an area means that the area has a good microclimate.

In the region, Lake İris is the area which has wetland ecosystems properties. It is formed of reedy and marshy area. The area and its surroundings are very important especially for the birds.

The vegetation intensity is divided into five groups as 0%-20% Bare rock, 20%-40% Very Poorly Intense, 40%-60% Poorly Intense, 60%-80% Intense and 80%-100% Very Intense. After the mapping and the land observations, the dominant group is understood to be "Intense" vegetation by 60%-80% (Fig.12).

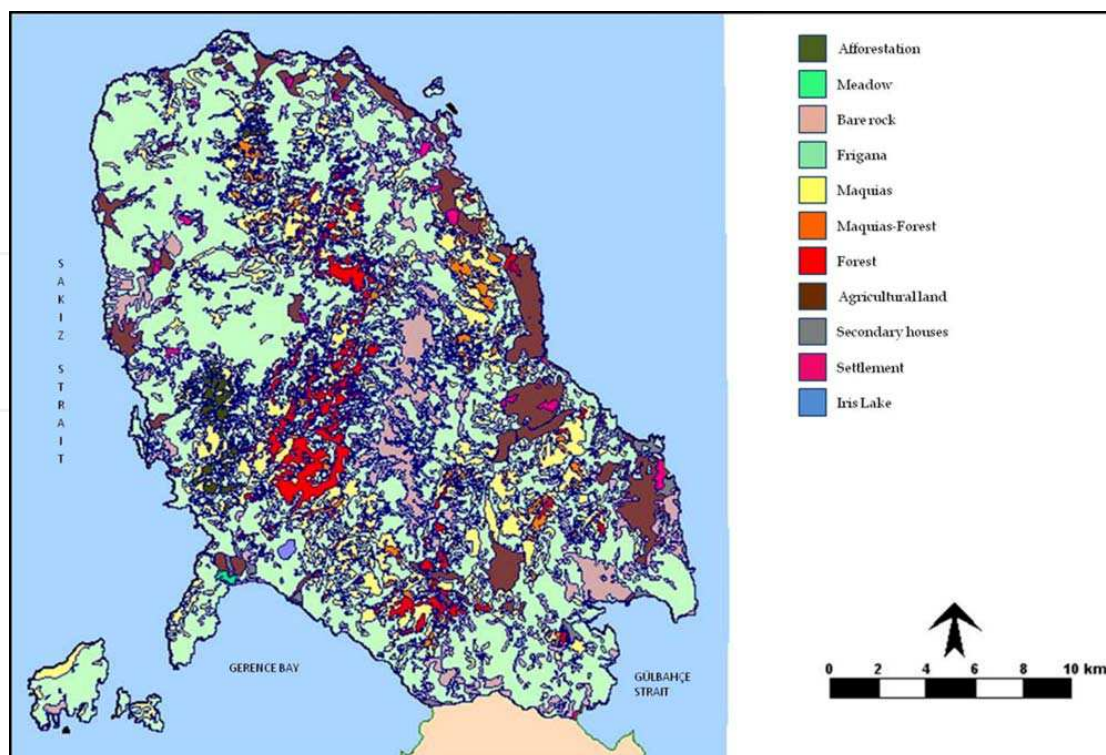


Fig. 11. Vegetation types



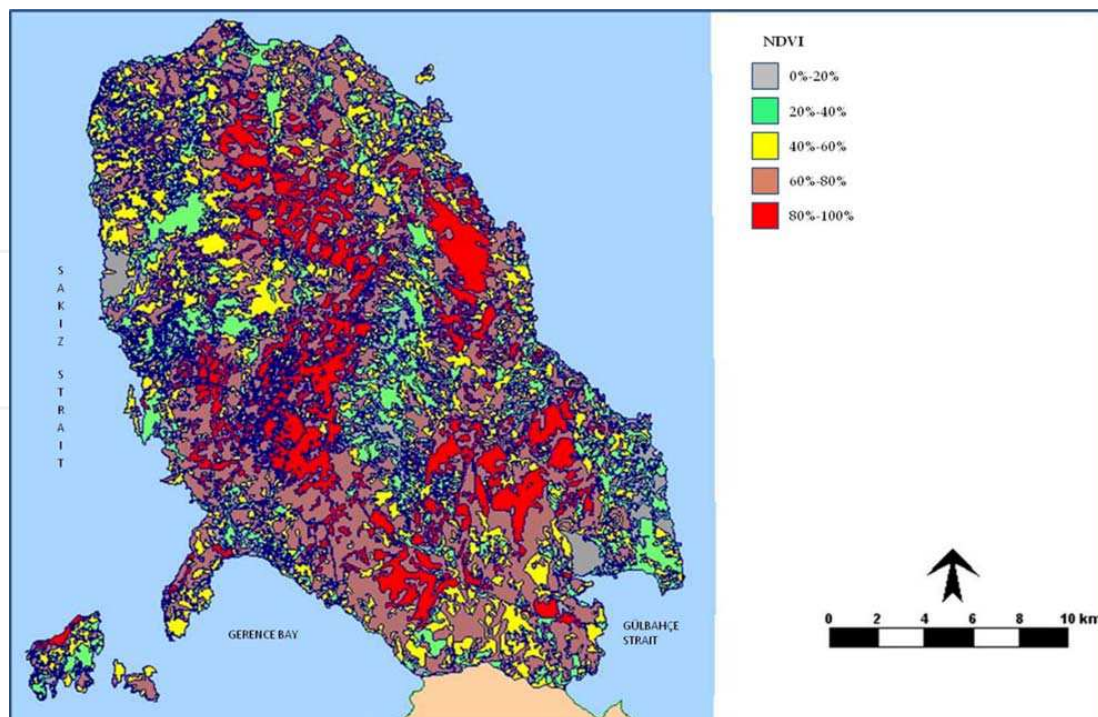


Fig. 12. Normalised Difference Vegetation Index (NDVI)

## 6. Conclusion

The natural and cultural values of the peninsula are sometimes destroyed although it is important in national and local scale. Unfortunately, the current protection status in the peninsula is not effective enough in terms of “protection”. This condition has both social and economic dimensions. The major reason of the failure in protection is that, the peninsula couldn’t reach a sufficient degree in economic development. As mentioned in the previous sections, “biosphere reserve area” formula has the “protection” and “development” components in itself and is the best solution for Karaburun Peninsula. First of all, it is obvious that the species and their habitats which need to be protected urgently must be rescued from human use and its pressure. With this in mind, for the protection of Mediterranean Monk Seals which are important in international scale, breeding caves and cavities are thought to be included in the “Core Area”. Since Mediterranean Monk Seals use the coasts and the sea together, it is a must to exclude the human-activity both from the coastal region and the sea eco-system while determining the “Core Area”. Fortunately, most of the breeding caves and cavities are in Natural Sites and this is an advantage in determining the “Core Area”. The location of two breeding caves in the Northern part of the peninsula is in the 1<sup>st</sup> Level Natural Site. Additionally, there is no second house settlement around the area. These two factors make it easy to take these definite breeding caves under protection. For the protection regions that are inside the sea, the data that “Mediterranean Monk Seals dive down to 40m in the Aegean Sea” is taken into consideration and in the “Depth Map”, 40m of depth contour is taken as the basis. In that case, “Posidonia” which spreads down to 40m depth, and supplies oxygen to stocks of the Mediterranean and the layer where the juvenile fish complete their growth is going to be taken under protection. On the other hand, the breeding cave in “Ayıbalığı” location which has vital importance for Mediterranean Monk



Seals is surrounded with intensive human use and does not have any protection status other than being a "No Fishing Zone". So, this zone which is determined by the General Directorate of Protection and Control is taken as the basis in determining the "Core Area". Other caves and cavities which are the potential reproduction areas of Mediterranean Monk Seals are included in the Core Area, although definite breeding records haven't been found yet. These caves and cavities are taken into borders of 200mx200m and the core areas which cover these caves and cavities are not connected to each other. If these areas are connected to each other, the dimensions of the area become larger. This situation causes difficulties in application because in this case no permission is going to be given for human use.

Similarly, if too many and wide core areas are formed in the sea, fishermen can react negatively and more threat can occur for the seals. Therefore, small core areas around the caves are thought to be more effective in protection.

Another important point is that, after the assessment of the data obtained from bird watch, the reproduction places of bird species of Spec1 and Spec2 which are important in global and European scales are thought to be included in the core areas. Of course the reproduction areas of Audouin's Gulls (*Larus audouinii*) which is in Spec 1 category are taken into the core areas, in order to provide sustainability of the species. These areas already have the Natural Site and Wildlife Protection Area Status which enabled us to label these areas as the "Core Areas". Most of the areas where Spec 2 category birds are observed have intensive human activity. Thus these areas aren't included in the "Core Areas".

15-22 and 10-15 different bird species are observed in "Bozköy" and "Lake İris", the areas which have richness in species of birds. Therefore, these areas are thought to be taken into consideration as "Core Areas" but since Bozköy and the surroundings have human settlements, it is excluded. Lake İris is accepted as a Core Area because it is very important for the birds and it is the only wetland of the peninsula. Moreover, no land use intersects with this area. All these features are important for this lake to be a Core Area.

In the area, existence of natural forests is continuously decreasing. Thus the natural forest and the dense textured maquis in the western part of "Bozdag" are considered as one of the "Core areas". Since Lake İris and its surrounding wetland is near "Bozdag", all of these mentioned areas are taken as one "Core Area". In fact this area has no protection status, so necessary attempts must be made to protect this region by law.

The reason why the number of core areas in Karaburun Peninsula is quite a lot originates from the obligation of protection of species which prefer different habitats and the obligation of protection of ecosystems which are under danger of extinction, instead of protection of a single species or a single habitat. In addition, due to much distance among these areas, independent and unconnected core areas are determined. "Buffer zone" which is surrounding the core area consists of the coastal areas (in order to control the housing), areas with very dense and dense textured maquis which have connection with the forests and maquis of the core area, destroyed sections of the natural forests, afforestation areas, habitats which are important for birds, areas where agriculture is not intense and Bozdag. In this area, a controlled usage is going to be applied. Bozdag is going to provide opportunities for activities such as climbing, walking, camping, bird watching, nature observation and reforestation of destroyed forest areas.

On the other hand, another equally important subject is the development of the peninsula.

In fact, the peninsula is an area which provides opportunities for the development of sustainable area usage activities such as agriculture, fishery and tourism. Regeneration of traditional area usage types in the area can prevent the migration of local population to metropolises. Production of “Hurma olives” which can be eaten directly after they are grown on tree, depending on the climatic features of the area, can be developed. The economy of the area can be regenerated by developing “sultani seedless grapes and wines”. In its history, the peninsula used to be an important center of trade with all these features.

The abandoned Greek villages in the area can be restored and evaluated within ecologic tourism concept. For providing the local people with income, any kind of alternative tourism model that is appropriate for the region can be planned, promoted and developed.

“Transition/development zone” which surrounds the buffer zone is an area where sustainable usage activities are going to be tried and developed. “Transition/development zone” includes the areas with intense agricultural activities and secondary housing. Waste vineyard areas between Kucukbahce and Sarpincik villages are left in the transition/development area in order to regenerate the local economy. Abandoned Greek villages are left in the transition/development area as well, in order to develop the ecotouristic activities.

Consequently, in Karaburun Peninsula recommended Biosphere Reserve Area Zoning is as follows: Core zone 8%, Buffer zone 48% and Transition/development Zone 44%.

It is satisfactory that these ratios are in a magnitude which is not going to create any disagreement between protection and usage.

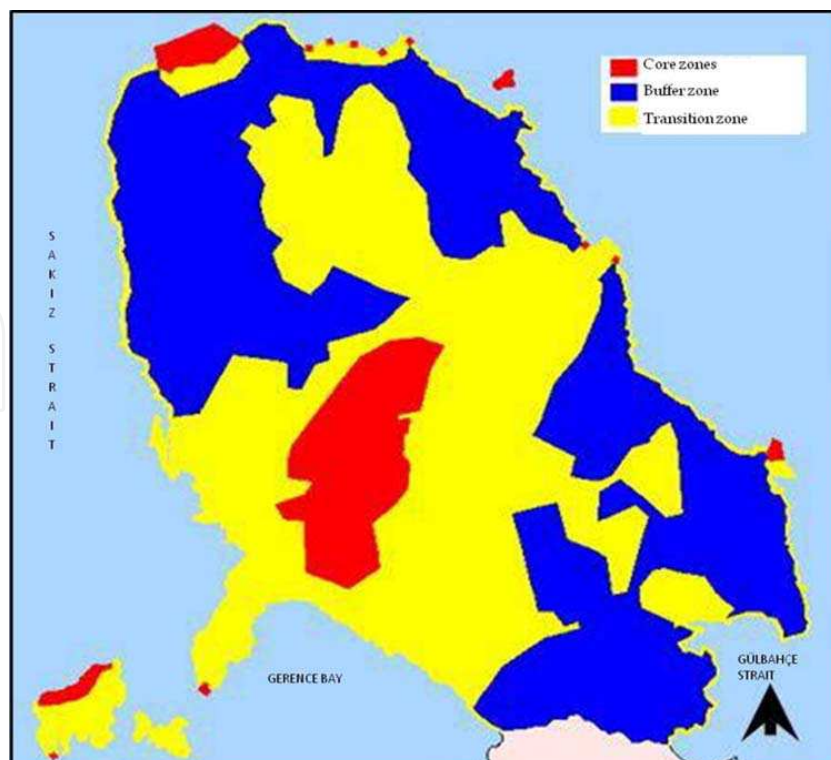


Fig. 13. Zones of Karaburun Peninsula Biosphere Reserve Area

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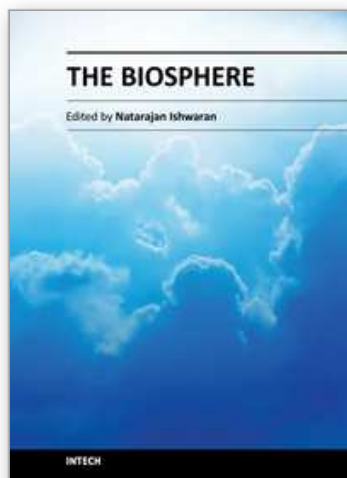
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## **The Biosphere**

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In this book entitled "The Biosphere", researchers from all regions of the world report on their findings to explore the origins, evolution, ecosystems and resource utilization patterns of the biosphere. Some describe the complexities and challenges that humanity faces in its efforts to experiment and establish a new partnership with nature in places designated as biosphere reserves by UNESCO under its Man and the Biosphere (MAB) Programme. At the dawn of the 21st century humanity is ever more aware and conscious of the adverse consequences that it has brought upon global climate change and biodiversity loss. We are at a critical moment of reflection and action to work out a new compact with the biosphere that sustains our own wellbeing and that of our planetary companions. This book is a modest attempt to enrich and enable that special moment and its march ahead in human history.

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