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Impact of geographical factors on coastal tourism between İğneada and Kastro Bay, Thracian Black Sea coast, Turkey

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Abstract

This study discusses the relationship between tourism and geomorphologic features, climatic comfort and natural vegetation cover in the coastal region from İğneada to Kastro Bay on the Black Sea. From the point of view of climatic comfort, Thermo-Hygrometric Index (THI) values indicate that May, June, September and October are favorable for coastal tourism while in the months of July and August temperatures are too hot. SSI index values indicate that comfort levels prevail for most people in June and September although the weather can be perceived by some people as cool. In July and August, when the temperatures are higher, the climate is comfortable part of the time, but it is rather hot and sticky. Despite climatic comfort conditions not being suitable for long-duration coastal tourism in the Kıyıköy-İğneada area, the floristic richness of the area and presence of longose forests offer many opportunities in terms of ecotourism. There are also numerous lakes and streams presenting unique possibilities for a variety of so-far unexploited tourism activities. Geomorphologically, uncontaminated sandy beaches and coastal spits as well as sheltered bays such as Kastro Bay are among the important assets of the area in terms of coastal tourism.

Keywords: Coastal tourism, climatic comfort, Thrace, Black Sea, Turkey.

Introduction

Without excepting the inland Sea of Marmara coast in the northwest part of the country, Turkey has a long coastline of 8333 km that extends from the Syrian border in the southeast to the border with Georgia in the northeast. Surrounded by the Black Sea and Mediterranean to the north and south, respectively, this long coastal strip provides a wide array of opportunities for sea and yacht tourism as well as ecotourism (Yılmaz et al., 2013), favored by suitable morphologic and climatic conditions. Nevertheless, environmental problems arising from industrial waste, lack of infrastructure, overpopulation, unplanned and rapid urbanization as well as degradation of the coastal forests and have caused serious pressure over the last 40 years, especially on the Mediterranean coastal landscape of Turkey (Akkaya et al., 1998; Atik et al., 2010; Dihkan et al., 2017). The coastal zone is very important for the national economy of Turkey and also the pressure on the coastal zone is very high. Approximately 44 % of the national GDP comes from the top ten coastal cities. The elevation of these cities changes between 3 and 100 m. The average elevation from sea level is about 50 m. According to Kuleli (2010), a total of 7319 km2 is lying below the 10-m contour line in the coastal zone of Turkey (Simav et al., 2015; Şeker et al., 2016).

Among the areas facing ecological disintegration are coastal regions where risk levels must be urgently taken into account (Burak et al., 2004; Senlier and Özturk, 2011; Gazioğlu et al., 2016). In some cases, as will be discussed herein, tourism activities may create negative consequences for tree-covered land near coastal destinations due to deforestation and forest fragmentation (Kuvan, 2012). Given the extent of the environmental impact of tourism, the Black Sea coast, has been comparatively less influenced by anthropogenic activities. This arises from both the shortness of the "sun, sand and sea" tourism season and less favorable climatic conditions, such as high rainfall and relative humidity, inadequate

sunshine duration and low temperatures (Güçlü, 2011).

In this paper, we discuss coastal tourism along the shoreline between the town of Kıyıköy and Kastro Bay (Fig 1) in the context of tourism-based environmental problems and existing potential previously unappraised. This coastal strip, and the area behind it, holds more than half the 12,000 plant species growing in Turkey; an ecological diversity that is due to the humid climate. Having great potential for ecotourism owing to the wild forests which have not been exposed to anthropogenic damage (Demir et al., 2016) and the coastal lakes formed by temporal changes in seasonal precipitation (Özyavuz, 2011), the studied area lies between İğneada, a coastal town connected administratively to Kırklareli in the Thracian part of Turkey, and Kastro Bay (Fig 1). This coastal area and its surrounding hills and ridges, i.e. the NW-SE-trending Strandja Mountains to the west, has potential for alternative tourism activities due to its cultural and archaeological heritage in addition to unpolluted rivers running down from the highlands to the floodplains and floodplain forests (longose) and extensive sandy beaches. Thus the area has a biosphere-reserve potential (Gazioğlu, et al., 1997; Özyavuz, 2008; Özyavuz and Yazgan, 2010). It should be noted that this part of the Thracian Black Sea coast of Turkey possesses exceptional importance due to the entity of the Strandja Mountains, such that the whole Black Sea coastal belt from the Georgian to Bulgarian borders (about 1700 km) does not provide equal tourism opportunities. On the other hand, the existing tourism potential of the area has not been appropriately appraised due to a misperception of "coastal tourism", which is due substantially to the day-trippers and visitors coming from nearby cities and the metropolis of Istanbul. We therefore discuss how the existing potential can be properly evaluated and in what way the existing perception of coastal tourism can be changed.

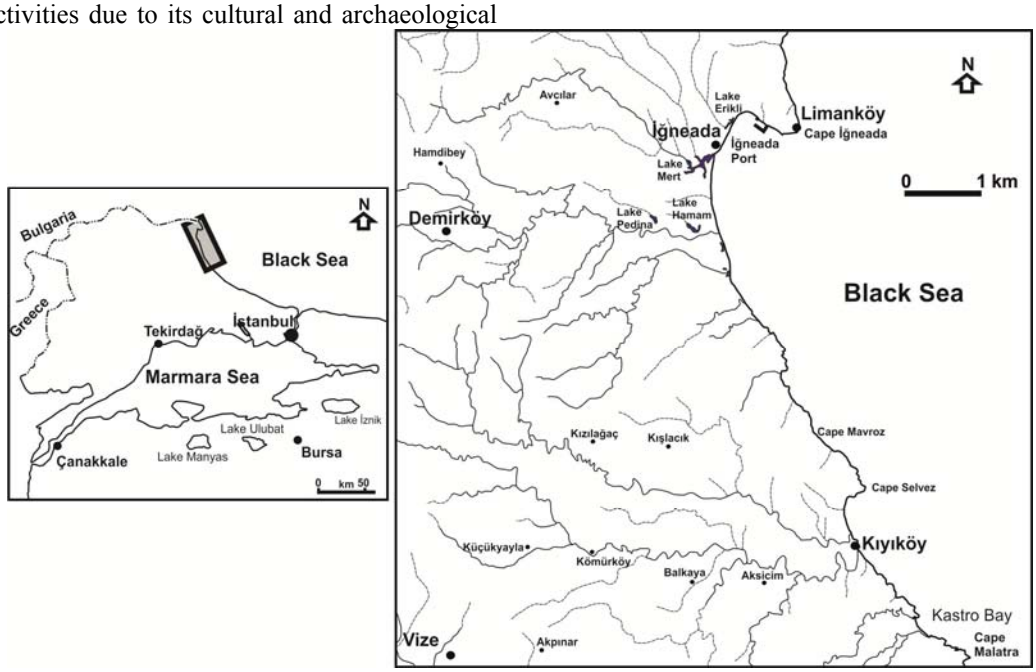

Fig. 1. Location map of study area.

Study Area

The study area comprises a 45-km stretch of shoreline on the Thracian Black Sea coast (about 800 km long) of Turkey extending from İğneada to Kastro Bay, which is 8 km southeast of Kıyıköy, a coastal town. The area is a seaward (northwestward) extending lower plateau of the Strandja Mountains, a massif composed of basement rocks such as gneiss, amphibolite and schist as well as granite and limestone (Pamir and Baykal, 1947). According to data (1975-2006) obtained from Kumköy

Meteorology Station to the southeast, the area receives annual precipitation of 831.4 mm. The average annual air and seawater temperature is 13.8ºC and 14.3ºC, respectively. A five-month period from May to September corresponds to a warm period when the value of evaporation from seawater is about 600 mm/yr, significantly lower than that of the Mediterranean (about 2000 mm/yr). From the climatic viewpoint, a humid-temperate Black Sea climate prevails (Türkeş, 1996; İyigun et al., 2013) and the tidal range is less than 30 cm. Access to the area from Istanbul or Edirne near the Bulgarian border is possible via the European E80 motorway. Both towns, İğneada and Kıyıköy, lie at a distance of about 200 km from Istanbul.

Fig. 2. . Filled area used as a car park on east coast of İğneada Port (a) and intensive use of the sandy Iğneada beach stretching in a southwest-northeast direction (b-d).

Materials and Methods

This paper is based mainly on field studies. During the spring and summer months (May-August) of 2010 and 2011, field observations along the coastline were performed during periods when coastal tourism was either sparse or intense. The natural potential of the area such as landforms, water resources and plant communities together with anthropogenically-induced land use and settlement patterns as well as population pressure on the land before and during the tourism season were examined and photographed on site. 1/50,000-scale topography maps prepared by the Turkish General Command of Mapping were used in the field studies. To determine existing land use patterns in the study area, Coordination of Information on the Environment (CORINE) land use classification by the Ministry of the Environment and Forestry was used. In order to process spatial analysis of the data prepared in a vector format, we used Arc-GIS 9.3.1 software. The raster (grid) data is first converted using Geographic Information Systems software. The raster data produced were reclassified in accordance with the purpose of the study. Various classes of land use were identified, such as forest land, maquis and bush, meadow and pasture, dry agriculture areas, settlements, harbors, water bodies, beaches and sand dunes. From the analysis, each type of land use was calculated and the land use map was produced accordingly. To determine the relationship between tourism and climatic comfort, climatic comfort indexes were calculated. To this end, the Summer Simmer Index (SSI) and Thermo-Hygrometric Index (THI) were used to evaluate climatic conformity on coastal tourism in the

study area (Pepi, 1999; Tzenkova et al., 2007). Climatic comfort calculations were performed using the 32-year (1975-2006) average of meteorological data obtained from Kumköy Meteorology Station (41.15ºN-29.02ºD), the nearest coastal station to the study area.

Results and Discussion

Coastal tourism around İğneada

The coastal zone from Limanköy to Kastro Bay extends in a northwest-southeastly direction parallel to the Black Sea coast and is restricted to the west by the Strandja Mountains. This area forms part of the northwestern Thracian Black Sea coast of Turkey. The Limanköy settlement is located on the southeastern tip of a low plateau.

Tourism on the Limanköy coast is developing rapidly today. Second homes occupy space around the settlement of Limanköy. These summer residences have mostly been built on the low ridge behind İğneada Harbor. Second homes have also been constructed behind the French-made lighthouse to the east of Limankoy (Morgül, 2014). Although these houses were built on a plateau (Kurter, 1964), access to the sea is provided via narrow pathways down through small stream beds.

The surroundings of Cape Limanköy are composed entirely of high coastal cliffs with the exception of the fine sandy Iğneada beach that stretches in a southwest-northeast direction. This 150-meter long beach is a coastal sand fill area lying to the east of Iğneada Port. The area behind this man-made beach is used as a parking area for daily visitors. The beach is crowded throughout the tourism season due to heavy demand (Fig 2).

To the south of Limanköy, two lagoons, Lake Erikli in the north and Lake Mert in the south, form important natural environments for tourism. Lake Erikli is a narrow and long lagoon extending to the shoreline (southwest-northeast) at the mouth of Efendi Stream, which is dissected between undulating ridges at an altitude of 50-150 m (Fig 3a). The long axis in the northwest-southeast direction of the lagoon is 1 km long and the broadest part is 100 meters in width.

West of the lagoon there is a reed-swamp with a maximum width of 700 m. This swamp is limited by the alluvial plain covered with longose (water-covered) forest to the west (Fig 3b). 200 meters behind the shoreline, Lake Erikli occupies part of an alluvial plain covered with submerged forests and swamps. The Lake Mert lagoon south of İğneada also occupies the lower part of an alluvial plain, as with Lake Erikli (Fig 4). It lies close to the shoreline in a southwest-northeast direction. The western part of the lake is swampy, and is 2.5 km wide from north to south and 2 km wide in an east-west direction. The longose forest, which limits the swamp from the west, occupies a large area of the alluvial plain, which has gradually narrowed to the west. On the other hand, different data have been suggested about the surface area of the longose forests (Kavgacı, 2007; Kavgacı et al., 2011; Direk, et al., 2012; Özkan and Kubaş, 2012).

Fig 3. View of Lake Erikli and reed fields.

Fig 4. View of Lake Mert lagoon, south of İğneada, and summer homes.

Tourism along coast between Lake Mert and Kıyıköy

The longest beach between İğneada and Kıyıköy stretches along the shoreline to the south from Lake Mert lagoon. The so-called Panayır İskelesi beach is characterized by fine sand and reaches a width of 90-120 m in general though it narrows to 30 m in places. It is estimated that this long sandy beach has an area of 131 hectares (Özkan and Kubaş, 2012).

Fig 5. Lakes in lower basin of Bulanık Creek: (a) Lake Pedina, (b) Lake Hamam, and (c) Lake Saka. (Photo courtesy of Kıyıköy Municipality)

Fig 6. Views of Kıyıköy beach (a) before and (b) during tourism season (Photo courtesy of Kıyıköy Municipality).

In this area, there are some small lakes such as Lake Pedina (15 m asl), Lake Söğütlü (20 m asl), Lake Hamam (5 m asl), Lake Deniz (1 m asl) and Lake Saka (1 m asl) (Fig 5). The largest of these are the Hamam and Pedina lakes, surrounded by forest. Lakes Deniz and Saka, on the other hand, are found behind the shoreline.

This part of the coast between İğneada and Kıyıköy is important in terms of its attraction to tourists since it is a region where lagoons cover a wide area as well as forests of longose. However, it is reached only via an 8 km-long stabilized road deviating south from the Demirköy-İğneada highway, which is not suitable for use until the end of May. Between June and August, the roads are convenient for normal vehicles, but because of the numerous reptiles and pests living in the roadside habitat, tourists and campers are advised to be careful.

From Lake Saka (Fig 5), a 5-km long sandy beach with a width of 80-100 m extends to the Panayır İskelesi beach with 200 m length and 20 m width is among the important values of the area in terms of tourism destination (Malkoçlu et al., 2011). No particular activity was observed in this area, which has potential along the streams behind the beach for sportive activities such as sea bikes or boating. Active landslides are also developing in the cliffs behind the beach. In some areas, masses of soil have slid down and partly cover the beach surface.

To the south of Lake Saka (north of Kiyiköy), another suitable area for tourism is Poliçe Bay. Also known as Poliçe Port, this bay is 700 m wide and consists of dirty white sand. About 1 meter behind the storm barrier extends a low sand dune ridge. Caravan-style accommodation exists on stabilized low sand dunes such as at Panayır İskelesi in the northern part of the bay.
Selvez Beach, 250 m north of Kıyıköy, is a coastal strip preferred due to its proximity to the residential area. This beach, which has a length of more than 2 km and a width of 60 m, is the most convenient and attractive beach in the vicinity of Kıyıköy. The beach is made up of light brownish and yellowish beach sand, and is limited to gullies that have developed on weathered granites. The beach is extremely clean and it was observed that local and foreign tourists set up tents on the beach. However, the northern part of the beach is mossy and the presence of seaweed (Posidonia) detracts from the quality of the beach.

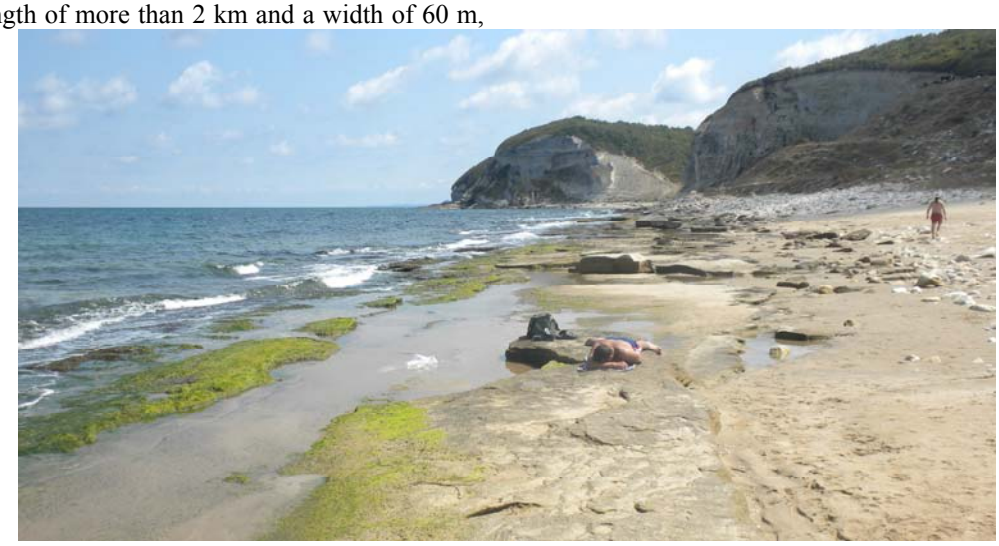

Fig 7. Beachrock used for sunbathing south of Kıyıköy Port.

Fig 8. Views of Kastro Bay: (a) Sea biking and (b) coastal spit.

Coastal tourism around Kıyıköy

Geomorphologically, Kıyıköy and its environs comprise a low plateau dissected by three main creeks, i.e. the Pabuç, Kazan Dere and Elmalı creeks. Pabuç Creek discharges into the sea from the north of Kıyıköy. As the channel widens to 30 m at the mouth of the river, it provides a stretch 1.5 km-long suitable for canoe tours. In this area, a large coastal spit exists with a length of 250 m and width of 140 m (Fig 6). This shoreline, providing an mportant opportunity for coastal tourism, is known as Kiyiköy Municipal Beach.

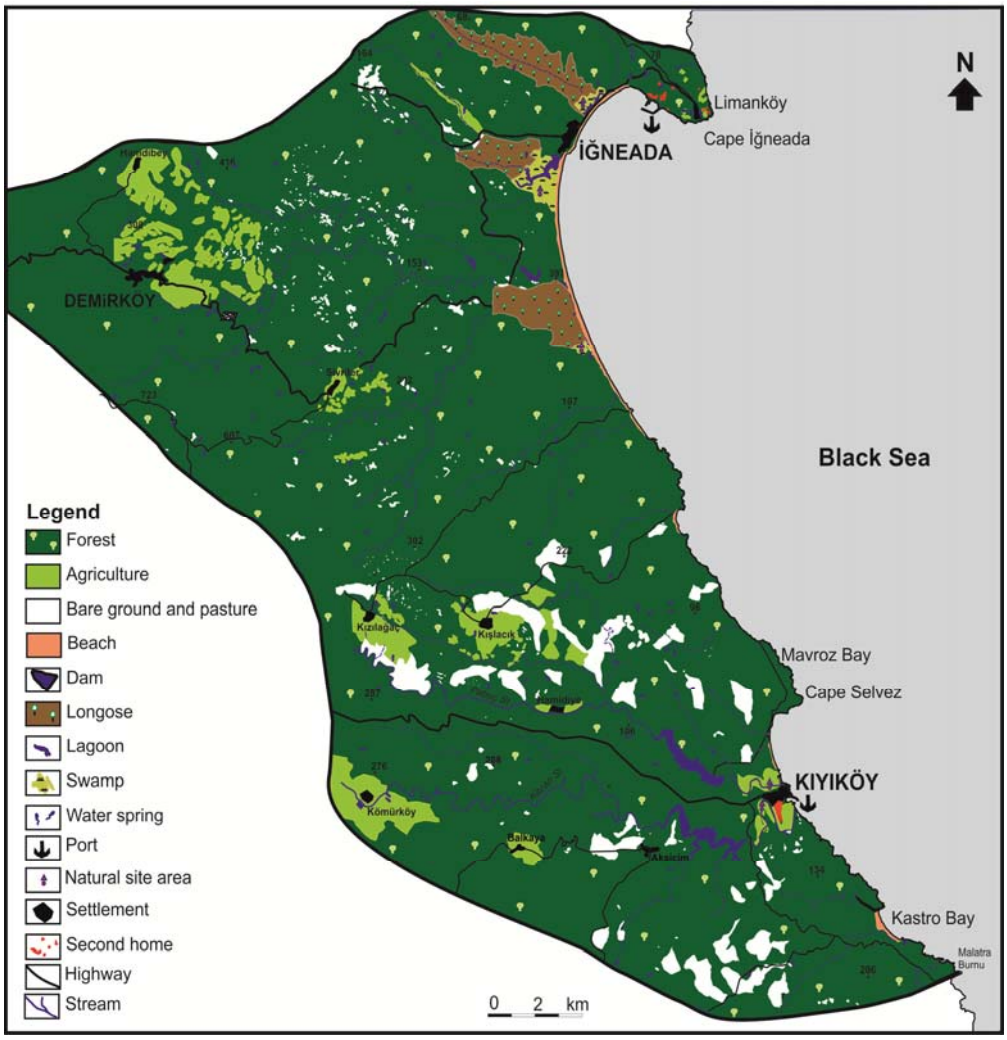

Fig 9. Land use map of the study area.

Fig 10. Longose forests around İğneada in (a) spring and (b) autumn (Photos: Orhan Uyanık)

A 700-m-long beach extending southwards from another coastal spit south of Kıyıköy Port has developed in front of the coastal sand dunes, which are 3 m high. The beach ends at the southernmost part with beachrock beds in front of an old stone quarry (Fig 7). The beach is used extensively during the summer season, and the surface of the beachrock beds is popular for sunbathing. Even though such cemented beaches colonized by algae colonies are not preferred as they make access to the sea difficult, they are of great importance for controlling beach morphodynamics and coastal erosion (Kontogianni et al., 2014). Thus, beachrock beds, the unique outcrop from the Black Sea coast (Erginal et al., 2013) acts as a natural protective structure for the sandy beach.

Coastal tourism around Kastro Bay

Kastro Bay is a large bay with a length of 1.5 km in a northwest-southeastly direction and a maximum width of 450 m inland. Since the width of the stream bed behind Kastro Bay is 40 meters, this large bed allows for navigation by sea bikes for a distance of 1.5 km (Fig 8a). In this area, camping sites and picnic areas are common because reeds and forests cover a wide area. Kastro Bay is a favorite location in the summer months (Fig 8b). The average width of the beach is 100 m. However, in the southern part of the bay, it is close to 200 m. The beach slope is low and the beach is made up of dirty yellowish sand. Located 3 km south east of Kastro Bay, the inlets of Kefalagzı Bay and Korsan Bay offer unique scenes of outstanding beauty.

Climatic comfort and coastal tourism

According to the 32-year data from Kumköy Meteorology Station (41.15ºN-29.02ºD) between 1975 and 2006, the average temperature in the study area is 13.8ºC. Taking the average values into account, there is an amplitude of 17.8ºC within the year. With respect to average minimum and maximum values, on the other hand, the amplitude is 25ºC. In July and August, the average temperature is above 20°C. This is true for the whole Black Sea coast and is the basic reason why the season in terms of coastal tourism is short. Starting from May, the total number of days when the maximum temperature is 20°C or higher during the day exceeds 10. The maximum temperatures during the day near the end of June, July, August, and September are 20°C and above.

The maximum number of days when the temperature is 25°C or higher during the day exceeds 10 days in June-September. However, the number of days at 25ºC and above is very small. Accordingly, the maximum temperatures during the day during summer are generally between 20°C and 25°C. This corresponds to a comfortable period in terms of temperature for coastal tourism, which has a decisive influence on the increasing influx of visitors in July-August.

Seawater temperatures, average air temperatures and insolation times run in parallel. The lowest values are in December on average for daily insolation duration, in February for average temperatures, and in March for seawater temperatures. The maximum insolation is reached in June, while the maximum average seawater temperatures occur in August. It is known that the optimum temperature in seawater varies between 22°C and 25°C, and that temperatures below or above this are not preferred (Ülker, 1988). While these conditions are appropriate in July and August, they are not suitable for sea bathing overall since the seawater temperature is below 20°C before July and after August.

According to average cloudiness values, the days when cloudiness is between 0 and 1.9 can be considered as open days. Cloudiness on cloudy days ranges between 2 and 8 days. Regarding cloudy days which are not suitable for tourism, the number varies between 8.1 and 10 days. Thus, cloudiness has a negative effect on coastal tourism in the study area. In fact, this reduces the length of insolation and reduces the temperature of the air and seawater. With the exception of the months of July-August when sunbathing is relatively good, cloudiness leads to climatic discomfort in the study area.

Wind is represented as coming from different directions in every season. While SSW winds are generally dominant in winter, there are

winds from every direction in the spring. The winds that are particularly effective during the summer period prevent the temperature from rising by having a cooling effect. This has a positive impact in terms of coastal tourism.

In this study, two climatic comfort indices were used to make a comparative analysis with selected tourism centers elsewhere in Turkey in order to evaluate the mentioned climatic characteristics in respect of tourism. Tables 1 and 2 show SSI values while Tables 3 and 4 show figures for THI. As is well-known, Climatic comfort studies consist of direct meteorological parameters expressed in simple mathematical formulas. Especially in tourism studies of Turkey, there has been an increase in research on this subject. Güçlü (2011) can be given as example. In the SSI index presented in Table 1 (also called the New Millennium Index), the air temperature and relative humidity values are taken as meteorological parameters (Tzenkova et al., 2007). Accordingly, SSI values are considered to be in the range of 70-150 and above. According to Kumköy Meteorological Station data, the area is suitable for coastal tourism from June to September.

Table 1. Monthly changes in SSI index values (1975-2006) at selected Turkish resorts.

SSI (°C) index values (1975-2006)												
Station	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Kumköy	30,75	29,98	35,14	47,28	61,33	76,43	84,47	85,40	73,95	61,63	7,21	37,19
Rize	33,90	33,15	37,71	49,93	62,51	75,70	84,02	85,12	74,78	62,28	48,59	38,75
Zonguldak	33,66	32,96	37,59	49,12	60,25	73,25	80,18	79,88	70,37	59,38	48,31	39,33
Florya	31,57	30,51	36,49	50,03	63,90	78,14	85,48	85,37	74,84	62,15	47,72	37,45
Yalova	34,20	34,20	39,24	52,10	65,51	79,28	86,09	85,97	74,97	62,23	48,65	39,97
Tekirdağ	27,36	27,92	35,48	49,72	64,72	78,51	85,43	85,01	74,78	60,70	45,10	33,46
Ayvalık	37,58	38,45	45,51	58,77	72,94	86,16	92,39	91,43	80,90	67,22	52,30	42,40
Bodrum	48,79	48,58	53,93	63,20	75,55	87,00	93,28	93,30	84,70	74,28	61,57	52,70
Marmaris	46,41	47,23	52,78	62,63	75,84	88,09	95,16	95,16	83,43	74,50	59,97	50,54
Fethiye	39,50	46,94	52,66	62,51	74,74	86,59	93,79	93,74	83,92	71,20	57,29	48,41
Kaş	52,52	52,03	55,99	64,69	75,97	85,84	93,56	94,63	87,05	76,25	64,81	56,25
Anamur	48,52	48,65	54,53	64,94	77,36	89,63	98,58	98,27	89,00	76,71	62,87	53,05
Mersin	46,50	48,25	56,10	67,82	79,56	91,07	99,63	100,32	91,13	78,17	61,53	50,63

Table 2. Monthly THI (oC) index values (1975-2006) at selected Turkish resorts.

THI (°C) index values (1975-2006)												
Station	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Kumköy	6,80	6,58	8,03	11,44	15,38	19,62	21,87	22,13	18,92	15,46	11,42	8,61
Rize	7,68	7,47	8,75	12,18	15,71	19,41	21,75	22,05	19,15	15,64	11,80	9,05
Zonguldak	7,62	7,42	8,72	11,96	15,08	18,73	20,67	20,59	17,92	14,83	11,73	9,21
Florya	7,03	6,73	8,41	12,21	16,10	20,10	22,16	22,13	19,17	15,61	11,56	8,68
Yalova	7,77	7,77	9,18	12,79	16,55	20,42	22,33	22,29	19,21	15,63	11,82	9,39
Tekirdağ	5,85	6,00	8,13	12,12	16,33	20,20	22,14	22,02	19,15	15,20	10,82	7,56
Ayvalık	8,72	8,96	10,94	14,66	18,64	22,35	24,10	23,83	20,87	17,03	12,85	10,07
Bodrum	11,87	11,81	13,31	15,91	19,37	22,59	24,35	24,36	21,94	19,024	15,45	12,96
Marmaris	11,20	11,43	12,98	15,75	19,45	22,89	24,88	24,88	22,45	19,08	15,00	12,35
Fethiye	10,89	11,35	12,95	15,71	19,15	22,47	24,49	24,48	21,72	18,15	14,25	11,76
Kaş	12,91	12,78	13,89	16,33	19,49	22,26	24,43	24,73	22,60	19,57	16,36	13,96
Anamur	11,79	11,82	13,47	16,39	19,88	23,32	25,83	25,75	23,15	19,70	15,81	13,06
Mersin	11,22	11,71	13,91	17,20	20,49	23,72	26,13	26,32	23,74	20,11	15,62	12,3862

Thus, June and September are somewhat cool, but comfortable for most people. The July and August months are comfortable for everyone, but rather hot. Compared to the weather on the Mediterranean and Aegean coasts, however, full comfort is experienced for only two months. On the other hand, discomfort caused by a high increase in temperature is not the case with Black Sea resorts. In this location, the weather also creates more beneficial conditions in terms of health.

The THI index values are presented in Table 2 according to the Besansenot classification

scheme (Tzenkova et al., 2007). In keeping with this, the May-June and September-October months are comfortable, while July and August are warm. The spread of the hot category especially over the Mediterranean coast for six months shows that sweltering warmth negatively affects comfort. In this case, the İğneada to Kastro Bay site THI values are comfortable for four months and in the warm category for two months.

Potential of vegetation cover for tourism

Based on the land use map generated from the CORINE land use classification produced by the Turkish Ministry of the Environment and Forestry, more than 80% of the study area is composed of forest land (Fig 9). The study area is located in the European-Siberian flora region, which completely covers the northern coasts of Turkey. Therefore, Euxine conditions are dominant in the area. In this context, plant cover in the study area can be evaluated in four groups, namely, moist (damp) forest, maquis-pseudomaquis, coastal plants, and longose forest.

The most remarkable plant community within this region is the damp forests (Atalay, 1994). *Fagus orientalis* and partly *Rhododendron ponticum* are common in the damp forests that ascend 500-600 m uphill on the northern slopes of the Yıldız Mountains. The rainfall in these forests usually exceeds 800 mm. At higher elevations, the precipitation can reach up to 1400 mm. In the coastal region, these forests descend to the pseudo-maquis and cover a limited area.

In the damp forests covering the northern part of the Yıldız Mountains, the common characteristic species of the Euxine zone are *Acer campestre*, *Alnus glutinosa*, *Carpinus betulus*, *Carpinus orientalis*, *Corylus avellana*, *Fagus orientalis*, *Rhododendron ponticum*, *Mespilus germanica*, *Quercus petraea*, *Quercus hartwissiana*, *Quercus robur* and *Sorbus torminalis* (Dönmez, 1968). *Fagus orientalis* dominates among the tree species mentioned. Another important feature of these forests is that they have a rich undergrowth flora represented by *Rhododendron ponticum* and *Ilex aquifolium* (Dönmez, 1968). Although *Fagus orientalis* predominates, *Fagus sylvatica* was also found, especially between the town of İğneada and village of Sislioba (Aydınözü, 2010). *Quercus petraea* is commonly found at levels between 500 and 600 meters above sea level. Towards the shore, oak forests cover the fields as a result of the destruction of beech trees (Dönmez, 1968). At altitudes less than 300 meters, oak is the dominant species.

In the forests of *Fagus orientalis,* undergrowth communities composed of *Rhododendron ponticum* and *Ilex aquifolium* have broad distribution. In addition, *Daphne pontica*, *Euphorbia amygdaloides*, *Hypericum* sp., *Trifolium* sp., *Rubus fruticosus*, *Fragaria vesca*, *Cistus villosus*, *Luzula* sp., *Viola silvatica*, *Campanula* sp., *Ranunculus primula*, *Genista tinctoria* and pteridophytes etc. form dense communities.

In the study area, there are maquis and pseudo-maquis communities along the shoreline from Kastro Bay to Iğneada. These plant communities, observed at up to 100 m elevation near Kastro Bay, are seen at between 30-40 m above sea level in the vicinity of İğneada. In this area, species of *Phillyrea latifolia*, *Arbutus unedo*, *Pistacia terebinthus* and *Cistus salviifolius* have developed. Pseudo-maquis along the coast of Limanköy consists of species such as *Phillyrea latifolia*, *Pistacia terebinthus*, *Paliurus aculeatus*, *Asparagus officinalis*, *Carpinus* sp., *Fraxinus ornus* and *Cornus mas*.

*C*oastal plants consisting of salt-tolerant species are mostly observed on low sand dunes, especially behind sandy beaches, and are found around Iğneada, Kıyıköy and Kastro Bay. The main species are *Ammophila arenaria*, *Anthemis maritima* sp., *Centaurea* sp., *Convolvulus* sp., *Euphorbia* sp. *Ganucium flavum*, *Pancratium maritimum*, *Salicornia* sp., *Silene* sp. and *Verbascum* sp.

Alluvial plains at the mouth of rivers are home to longose (subasar) forests in the rainy season. These forests have developed extensively on the moist soil and clayey soils (Fig 10). Longose is an ecosystem formed by the accumulation of sand brought down by streams flowing into the sea, creating a barrier on the shore that closes the mouth of the stream. The most important condition for the sustainability

of this unique ecosystem is abundance of water, transporting the clay and organic material onto the soil and thereby enriching it in mineral and organic material. Only certain types of trees and plants (e.g. *Leucojum aestium*, *Butomus umbellatus*, etc.) and bird species (e.g. *Ciconia nigra*) have adapted to this habitat.

The main plant elements of the longose forest in the study area are *Fraxinus ornus*, *Alnus glutinosa*, *Ulmus campestris* and *Salix* sp., with proportions of 50%, 34%, 11% and 5%, respectively (Atalay, 1994). *Acer campestre*, *Populus tremula*, *Carpinus orientalis*, *Fagus orientalis* and some oak species are observed in lesser quantities. Species such as *Prunus spinosa*, *Rubus fruticosa*, *Corylus avellana*, *Acer pseudoplatanus*, *Crataegus monogyna*, *Sorbus torminalis*, *Sambucus nigra*, *Hedera helix* and *Similax excelsa* form the shrub level of the longose forest. *Rubernus fruticosus*, *Ranunculus* sp., *Veronica hederifolia*, and *Viola silvatica* constitute the undergrowth ecosystem of the forest.

These longose forests are registered as a National Park and cover an area of 3,000 hectares (Özyavuz and Yazgan, 2010). They are found in remarkable abundance on the alluvial plains of Çavusdere and Bulanıkdere streams to the south of İğneada town. In the downstream of Rezvadere to the north of İğneada, another longose forest comprises a narrow corridor extending 1 km inland from the coast. Some of the moist alluvial plains around İğneada are covered with *Fraxinus ornus* communities.

The best example is the large alluvial plain of the Efendi Stream behind Lake Erikli north of Iğneada. This valley basin is covered with *Fraxinus* associations. Along with this, some communities of *Corylus, Ulmus*, *Populus*, *Carpinus* and *Quercus* are found. Another important distribution area of the *Fraxinus* species is located to the north-east of Lake Erikli.

Ecotourism potential based on floristic variety

The study area has great potential for ecotourism due to its rich flora, such as the damp forests, shrubs and pseudomassic communities, salt plants on sand dunes and longose forests. The forests are preferred by visitors for their clean air and suitable climatic comfort conditions in the months when the temperature is higher. Many activities are possible in the forest, such as picnicking, trekking, camping and photography. Forest flora and fauna richness play a major role as well as the presence of clean water sources suitable for angling in the forest. To exploit this potential, there is a need to invest in tourism facilities which may include rest places in the forest, watchtowers, and bird and wildlife observation hides. The Hamam and Pedina lakes in the forest and the lagoons on the coast offer extremely favorable conditions for nature photography and trekking. There are several walking routes, such as the İğneada-Lake Mert-Sivriler route along the coast, the Lake Saka route along Bulanık Creek valley, the İğneada-Lake Mert route and the Demirköy-Kadınkule-Monapetra-Velika Bridge route in the inner part. However, there is a need to signpost the walkways along these routes (Çakır and Çakır, 2012). Lake Mert and its vicinity near İğneada, which is at the entrance to İğneada and Lake Erikli, is one of the favorite picnic areas. Except for the high quality asphalt roads between İğneada-Demirköy and Vize-Kıyıköy, the roads through the forested areas are almost completely dirt roads. This should not be regarded as a deficiency since guided walks and group safari tours can be organized along these tracks. These forest roads are also suitable for cycling events and trekking.

Conclusion

The coastal area between İğneada and Kastro Bay to the south of Kıyıköy is characterized by various geomorphological units such as low-lying plateau surfaces dissected by river valleys within damp forests, sandy beaches, coastal spits and sheltered bays. These provide various opportunities for coastal tourism and alternative tourism activities. Unfortunately, tourism in the area has made little progress so far. This is mainly due to the shortness of the summer season for coastal tourism. As confirmed by the Summer Simmer and Thermo-Hygrometric indices, July and August are the most comfortable in terms of traditional sun, sea and sand tourism. Due to warm but lower air temperatures compared to the Mediterranean coast, this provides favorable conditions for the health of visitors as well. The asset of damp forests as well as longose in the area, together with streams that lead to wide-mouthed estuaries, may be a boon for ecotourism and other tourism activities. Despite the enormous ecotourism potential of the area, tourism is limited to coastal tourism from June to August. Since camping is the most common and

preferred type of accommodation, the lakes, stream valleys and beaches face serious environmental problems if growth continues unabated. Therefore, all these factors need to be taken into consideration when planning a sustainable tourism agenda for this region.

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