

General Overview of the Tombolos on Turkey's Coastlines

Mehmet Akif Ceylan

Department of Geography, Faculty of Arts and Sciences, Marmara University, 34722 Istanbul, Turkey

Abstract: This paper deals with 11 tombolos, which have hosted urban settlements throughout the long historical process, on Black Sea, Marmara, Aegean and the Mediterranean coastlines in Turkey. Unfortunately, most of these tombolos that draw attention with their unique appearance within the coastal geomorphology, have not been studied to date. Therefore, this paper aims to make contributions to coastal geomorphology of Turkey. This paper provides brief information, not exceeding several paragraphs, about the formation and functional characteristics of tombolos. The fact that this study is a first in Turkey and that the number of tombolos is relatively high prevented from going into details. 2 of the tombolos dealt with in this paper are located on the Black Sea coastline, 2 on the Marmara coastline, 5 on the Aegean coastline and 2 on the Mediterranean coastline.

Key words: Coastal geomorphology • Sinop • Amasra • Belkıs • Bodrum • Alanya

INTRODUCTION

Turkey is a country surrounded by sea on three sides and located between Europe and Asia continents. Total length of coastlines of the country is around 8333 km. A variety of different landforms developed under geomorphologic factors and processes can be observed along these coastlines. One of these landforms is tombolos, which draw attention with their unique morphological appearance. A tombolo can be briefly described as a landform in which an island is attached to the mainland or to another island by a narrow piece of land such as a sandbar [1, 2, 3]. Tombolos, which are addressed with their different aspects within the scope of Coastal Geomorphology in this paper, are primarily a natural wealth of the country.

Tombolos have many functional characteristics and impacts considered within the scope of physical and human geography. Primary ones are as follows: (a) Generally a peninsula is formed when an island is attached to the mainland by a tombolo. In other words, there is a relief change. (b) Tombolos mainly form a natural harbour with two shelters. (c) They provide some advantages for settlement in terms of defence. (d) Natural attractions created by tombolos and particularly beaches, are important in terms of tourism. (e) Some tombolos change the speed and direction of streams on the coasts. (f) Tombolos may create lagoons, wetland and within this

context, new natural habitats. (g) Agricultural activities are carried out over some large tombolos. (h) Parks and gardens are built on some tombolos for recreational purposes. (i) Some tombolo lagoons were used for production of salt in the ancient times. (i) Furthermore, tombolos and their surroundings have been important topographic sites for urban settlements since the Antiquity.

Sinop Tombolo: It corresponds to a natural sheltered harbour, where the Sinop Castle is and the first centre of the city was located, on the Black Sea coastline (Fig. 1). This tombolo is among the largest and most well-known ones in Turkey. Essentially, this tombolo has formed as a result of the isthmus structure and morphological landscape of the Sinop Peninsula. As a matter of fact, considering the nature of the deposits, it can be understood that there was once a shallow shore between two islands that existed in the past off the coast and the land mass and that a beach that had started forming on the southern part of this shore gradually expanded and connected the islands to the mainland [4].

Sinop is the most typical isthmus city in Turkey (Fig. 2). As a matter of fact, the location where the city was established is an old tombolo with a length of around 1.5 km, width of maximum 300 m at the narrowest part and 15-20 metres high from the sea [5].

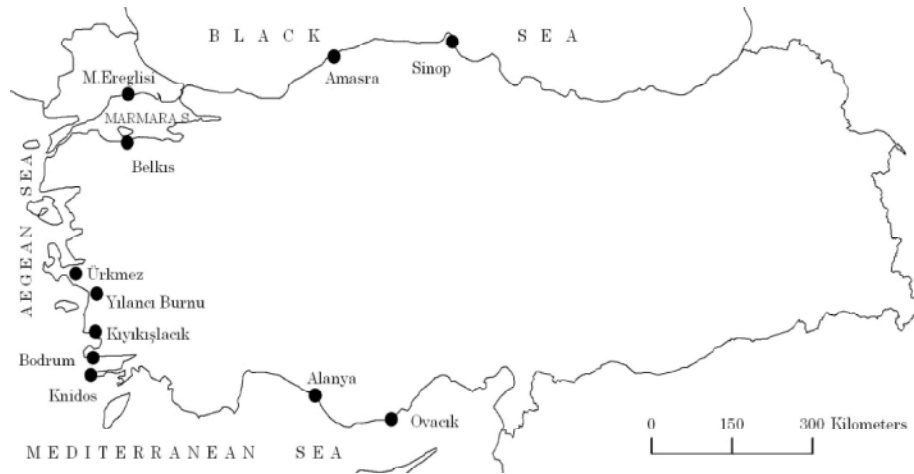


Fig. 1: Distribution of the tombolos along Turkey's coastlines.



Fig. 2: General view of city of Sinop and the tombolo area from Hıdırlık Hill.



Fig. 3: General view of city of Amasra and the tombolo area.

The tombolo is one of the main factors that played a role in establishment of the city of Sinop in this location. With its inner and outer harbours, the tombolo prepared the natural conditions for development of the harbour function of the city. The castle was built on the narrowest

section of the tombolo, which is related to the advantages provided in terms of the defence of the city. Furthermore, the tombolo forms a shoreline with a beach on the edge of the city and in this context, it played an important role in development of tourism.

Amasra Tombolo: It is the second largest tombolo after Sinop on the Black Sea coastline of Turkey. A major portion of the settlement area of Amasra is located on this tombolo (Fig. 3). Before formation of the tombolo, regression of Amasra syncline led to formation of a bay with a length of 2.5-3 km and depth of 500-600 meters, as well as islands off this bay near Amasra [6].

A sandbar formed by the detritic materials brought down by the Hisarönü Stream that receives its first tributaries from the northern sides of the Küre Mountains first connected the former island Tekke (Kumbahçe) Hill and subsequently the old Zindan (Kale) Island to the Anatolian coast. Thus, this tombolo with a length of around 500 metres and width of 200 metres and the old Zindan island transformed into a peninsula. The bay to the west side of this peninsula is called the Küçük Liman (Little Harbour) and the one to the east side Büyük (Amasra) Liman (Big Harbour).

Today, the Kum District, where there are many commercial and tourist facilities, is located on the tombolo. With a relatively long and wide beach, called Kumyalı, on the eastern side, the tombolo is one of the natural tourist attractions of Amasra. Furthermore, the old Zindan (Dungeon) island is connected to the Küçük (Small) island on the eastern side through a tombolo and to Boztepe located to the northwest by means of the historical Kemere Bridge.

Marmara Ereglisi (Perinthos) Tombolo: It is located in the location where the city with the same name was established and which is the administrative centre of a town (population in 2009: 10491) that belongs to the Tekirdag province, on the northern coastline of the Sea of Marmara. A small island (with a length of around 1000 m, width ranging between 200 and 300 m and elevation of 56m) approximately 600 m off the old coastline is

connected to the mainland by two tombolos to form a peninsula. The tombolo was formed with the contribution of detritic factors brought to the coast by Kamara Stream on the east and Kum (Ali Lake) Stream on the west. A relatively sheltered small bay, a natural harbour (inner harbour), was formed on the north-eastern side of Marmara Ereglisi, which is a peninsula, a tombolo consisting of Mioocene-aged sandstone and marls [7]. Expansion of the alluvial plain, which is currently called the Geren Plain where the city is located, on the tombolo toward the east led to narrowing and shoaling of the inner harbour in the course of time. Likewise, relatively long shorelines developed on the edges of both tombolos.

When considered in functional terms, the tombolo and its surroundings form a coastline convenient for development of tourism with the site of establishment of the city, a natural harbour resembling a crescent moon, topographic characteristics facilitating defence of the city and beaches. Particularly in the Antiquity, Perinthos was one of the major harbours on the coasts of the Sea of Marmara along with Istanbul (Byzantium) and Belkıs. In addition to its harbour function that still maintains its importance, the city has recently demonstrated a rapid development with the industrial establishments and construction of summer houses and tourism facilities.

Belkıs (Kyzikos) Tombolo: This tombolo was formed as a result of the fact that the sandbars developing from both sides between Bandırma and Erdek on the southern coastline of the Sea of Marmara have connected the relatively wide and high Kapıdağ (Dede Bayırı Hill, 803 m) mass (old Arktonnessos/Ayı Island) to the Anatolian coasts. Named after a historical city (Kyzikos), the Belkıs Tombolo is the best known example of double tombolo in Turkey (Fig. 4).



Fig. 4: Belkıs tombolo (Bandırma-Erdek).



Fig. 5: Urkmez tombolo (Seferihisar).

The low area that separates the Bandırma and Erdek Bays is an isthmus with a width of 1700 m and length of 1500 m and attaches the Kapıdağ Paleozoic massive to the main mass. There are two sandbars on the Kapıdağ Peninsula, one on the east and one on the west and are separated by a swamp. The sandbars were formed in the shallowest part of a ridge composed of bedrock. The spits extending from two edges, also making use of some bedrock projections (Karakafa Hill 14 m) connected the groundmass and the island. The swamp land in the middle has gradually narrowed by human interference. This area called Belkıs Swamp (950 m in the north-south direction and 850 m in the east-west direction) was, undoubtedly, a lagoon in the past. Subsequently, it has transformed into a swamp. A number of historians suggest that the bays on both sides had been connected to each other by means of a canal dug on this isthmus that was located within the site of a bright civilization in the Antiquity. However, the exact location of the canal, the date when it was dug and the date when it was abandoned are not known [8]. As a matter of fact, there are no traces of a canal today. The western side of the tombolo has become an agricultural area, covered by vineyards, olive groves and fruit orchards. On the other hand, the east side is covered by sand dunes and a land route leading to villages exists today.

Kapıdağ from time to time became an island and a peninsula due to canals and bridges constructed in the Antiquity. However, historical sources suggest that the Belkıs Tombolo has had an appearance similar to the current one for over 2500 years [9]. As a matter of fact, Strabon suggests that Kyzikos was an island in Propontis and was connected to the mainland by two bridges. It draws attention not only with its fertile soil, but also with its 500 stadia circumference. Strabon further suggests that

there was a city with the same name near the bridges and that the city had two harbours that could be closed when necessary, with a shelter large enough to accommodate more than 200 ships [10].

Urkmez (Lebedos) Tombolo: This tombolo is located at the Doğanbey Bay in the Aegean Sea, within the settlement area of the Urkmez region of the Seferihisar town of the İzmir province. An old island, which is presently called the Kısık Peninsula and has the ruins of a castle belonging to the ancient Lebedos city, is connected to the mainland by means of a simple tombolo (Fig. 5). The old small island has a length of 175 m, width of 201 m and an elevation of 61 m. Detritic factors brought by the Urkmez Creek and some smaller streams flowing into the sea approximately 1 km to the west contributed to formation of the tombolo. With a width of approximately 200 metres and a length of 200 metres, the tombolo area and its surroundings are convenient in terms of defence and settlement. As a matter of fact, existence of an ancient settlement at this point reflects this fact.

Yılcı Burnu (Neopolis) Tombolo: It is located on a peninsula with the same in the Hacı Feyzullah District of the Kuşadası town of the Aydın Province. Some sources mistakenly refer to this area with the name Yılcı Burnu (Yılcı Cape). It is rather a simple tombolo that formed through connection of a small island (maximum length of 185 m and width of 100 m) to the mainland by means of a sandbar with an approximate length of 300 m. The narrowest section is 45 m at the point where the sandbar connects to the island. There was an ancient settlement called Neopolis, which is thought to have been established by Ionians, on the island that is connected to the mainland by the tombolo.



Fig. 6: Kırıkışlacık tombolo (Güllük Bay).

The Yılancı Burnu (Yılancı Cape) tombolo and its surroundings remained within the settlement area of the city, as Kuşadası extended towards the south in the course of time. With many facilities and a quay, the tombolo and its surroundings are functionally a tourism resort today. The olive and pine trees on the old island, which is a protected area, draw attention.

Kırıkışlacık (Iasos) Tombolo: It is located on the north-eastern coast of the Güllük Bay, in the location of the ancient Iasos city, in the Kırıkışlacık Village of Milas Town. This city was located on a small rocky island, near the shore, within a bay. Length of the island was around 1 km and the elevation was 56 m (Kale Tepe-Castle Hill); it resembled an unshelled almond. The northern side of the island has combined with the mainland in the course of time. But, it was separated from the land by a canal due to defensive concerns throughout its history. The location of the canal is a swampy area along the isthmus. The only plain of the island is along the isthmus. The harbour is located between the steep western slope of the island and the mainland [11].

The location and extension of the canal is clearly shown on the plan (drawn in 1835) of the Iasos city [12]. The location of the canal and the swampy area has a length of approximately 320 m, has completely disappeared today, even their traces have largely gone out of existence. Because, this area that created a narrow and shallow strait in the past was easily filled with the detritic factors brought by the streams from the rear high areas, as well as the colluvial materials from the northern slopes of the island. Thus, the island has become connected to the mainland with a relatively wide isthmus (Fig. 6).

Bodrum (Halicarnassus) Tombolo: It is located within the historical centre of the city, where the Bodrum Castle and Bazaar is located. The island where the second fortress existed in Bodrum (formerly Halicarnassus) was the place occupied by the Castle of Knights of St. John. The island connected to the mainland in the course of time. This island was the Zefiria or Zefirion Island where the Greek immigrants from Argos and Troezen had settled in the “dark ages”. The palace of Mausolus should have been located somewhere on the island or inside the fortress. The hidden harbour mentioned by Vitruvius was located between the island and the mainland. The hidden harbour was filled and the island was connected to the mainland only in the 1st century. In this century, Plinius counts Zefirion among the islands that were connected to the mainland. Its location is presently on the mainland [11]. Likewise, some geographers agree that the Bodrum Castle was located on an island that had been connected to the mainland [13].

The peninsula that has the same name and extends roughly in the northeast-southwest direction in the Bodrum Bay was formed as a result of connection of the Zefiria Island (that has a length of approximately 240 m and width of 220 m) to the mainland by means of a simple tombolo in the 1st century. Approximate length of the tombolo is 200 m and the width at its narrowest section is around 150 m. Small streams (Umurca Stream and the others) that flow into the sea on the eastern side had contributions to the development of the tombolo that widened in some places by human interference. The same streams also played an important role in development of the Kumbahçe Beach.



Fig. 7: Knidos tombolo on the Tekir Cape of Datça Peninsula.

Today, the historical Bodrum Bazaar is located on the alluvial plain area where the tombolo is located, the Bodrum Underwater Archaeological Museum and some tourism facilities are located in the castle located on the old island and there is a marina on the western side and beaches on the eastern side. Consequently, the tombolo area has an important function in terms of tourism within the land use of the Bodrum city.

Knidos (Cnidus) Tombolo: It is located on the Tekir (Deveboynu) Cape located on the western end of the Datça (Reşadiye) Peninsula, in the settlement area of an ancient city with the same name, Knidos. An island extending in the northwest-southeast direction at the end of the peninsula is connected to the mainland by a simple tombolo. Length of the tombolo is approximately 130 m and the width in its narrowest section is 82 m. With reference to I.C. Love (1968), it is suggested that the quays were covered by sand and an isthmus that connected the two pieces of land was formed and the traces of a wall indicates existence of a canal with a width of 10 m, which was built to combine the two harbours in this section [14].

Following formation of the tombolo, two bays with different widths and two natural harbours came into existence in the narrow strait between the mainland and the former island (Fig. 7). The harbour that is located on the northwest (the Northern Harbour) is more sheltered thanks to an embankment extending from the mainland to the island. The harbour located to the southeast (the Southern Harbour) is larger than the Northern Harbour. There are embankments on both shores between the tip of the island and the mainland.

Alanya (Coracesium) Tombolo: It corresponds to the Alanya Peninsula, where the castle is located, within the historical centre of the Alanya city, on the eastern coast of Antalya Bay. As a matter of fact, Texier states that the Coracesium (Dilvarda/Kaleardı) Cape, which was convenient for defence, was connected to the mainland by means of a sandy spit [12]. According to Erol, the Alanya city was established on the skirts of the Alanya Castle, which was on an island in the past, on a tombolo connecting the island to the mainland and to the east of the castle, for that location was protected from the strong southwesterers by the Kale Hill [15]. The former island where the Alanya Castle is located has a length of 1.5 km, width of 1 km and elevation of 212 m. The former island that is surrounded by high cliffs on three sides is connected to the mainland by a relatively wide tombolo on the northern side. With its natural characteristics, the peninsula is quite convenient in terms of defence and has sheltered harbours.

Ovacık Tombolo: It is located on the coast of Ovacık Village of the Silifke Town, where the Taurus Island Mountain mass extends into the Mediterranean as a small peninsula that is called Ovacık Island by the local people. The former Ovacık Island is connected to the mainland by two tombolos with an approximate width of 400 m. As a matter of fact, on a map titled “Geomorphology of the Ovacık Region”, which is attached to a book prepared as a doctorate thesis, this peninsula was marked as a tombolo [16]. It can be understood that the shallow lagoon located between the tombolos disappeared in the course of time. The Köşrelik Bay on the east of the Ovacık tombolo and the Bogsak Bay on the west form natural



Fig. 8: Ovacık tombolo (Silifke).

harbours and there are broad beaches on the coasts of these bays (Fig. 8). The former island, with the highest point named Karakalık Hill, has an approximate length of 2650 m and a width of 2450 m and has a rugged topography covered by maquis. Coasts of the former island out of the tombolo are full of high cliffs, convenient for defence of the city. There are remains of an ancient city known as Cilician Aphrodisias in the archaeology literature in the Ovacık Island.

CONCLUSIONS AND RECOMMENDATIONS

As a result of the studies we have conducted to date, it has been seen that more than thirty tombolos have formed on the coastlines of Turkey. A large portion of these tombolos have formed in the Holocene epoch. They are mainly in the form of simple tombolos, but there are double tombolos as well. The best example of these double tombolos is the Belkıs tombolo. Among tombolos, there are elevated tombolo examples such as Sinop. All tombolos dealt with in this paper are examples of tombolos that developed between an island and the mainland. Tombolos may have very different dimensions. Belkıs tombolo is the largest tombolo in Turkey in terms of its covering area.

Brief information and sketches, which provide information about the formation and characteristics of the tombolos that have interesting look and a variety of functional features, can be displayed on boards located particularly along the land routes, as well as in locations considered appropriate. Likewise, it would be beneficial if similar information is provided in relevant textbooks and in publications and on web pages regarding tourism. It is necessary to solve the ownership

issues of some tombolo areas, to protect them under a variety of statuses, to plan use of tombolo land and to unearth historical artefacts through archaeological excavations.

Furthermore, there is need for more detailed scientific researches examining each tombolo, for which only brief information has been provided in this paper, in terms of both physical and human geography.

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