EMERGENCES AND NESTING ACTIVITIES OF LOGGERHEAD TURTLES (*CARETTA CARETTA*) IN YANIKLAR AND AKGÖL, 2016

Dana Lambropoulos

KURZFASSUNG

Seit 1994 veranstaltet die Universität Wien, unter der Führung türkischer Universitäten, ein jährliches Projektpraktikum ("Sea Turtle Field Course") in Fethiye, Türkei. Zu den Hauptzielen dieses Programms gehören der Schutz, die Erhaltung und die Erhebung der regionalen Population. Im Zeitraum zwischen Juni und September wurden in Nacht- und Morgenschichten verschiedene Daten über die Eikammern, Distanzen bei Spuren und Nester der unechten Karettschildkröte (*Caretta caretta*) gesammelt. Das Ergebnis war eine große Zahl an Daten über 94 Nester, 5 adulte Weibchen und 66 Spuren. Die unechte Karettschildkröte wurde von der IUCN ("International Union for Conservation of Nature and Natural Resources") als "vulnerable" eingestuft, gleichzeitig werden die Strände Yaniklar und Akgöl aber auch touristisch genutzt. Andere Zonen des Strandes sind sandig und flach, somit gut als Niststrand geeignet. An fünf touristisch kaum genutzten Abschnitten kann man sogenannte „Hotspots" finden, dort verdichtet sich die Anzahl der Nester. Obwohl Fethiye seit 1988 als "Special Protected Area" ausgewiesen ist, waren die Landgänge von *Caretta caretta* 2016 in Yaniklar und Akgöl nur zu 27,3% erfolgreich, es gestaltet sich für die Weibchen schwierig, geeignete Nistplätze zu finden.

ABSTRACT

Since 1994 the University of Vienna has been conducting the "Sea Turtle Field Course" in Fethiye, Turkey, under the guidance of Turkish universities. The aims of this program are observation, conservation, protection and research of the Loggerhead turtle (*Caretta caretta*). Between June and September, 94 nests, 5 adult turtles and 66 tracks were observed in Yaniklar and Akgöl. During morning- and night patrols, data on nests, adults, hatchlings, tracks and temperature were collected. This sea turtle species is listed as "vulnerable" by the IUCN (International Union for Conservation of Nature and Natural Resources) and Fethiye was designated as a "Special Protected Area" in 1988. Some areas are equipped with sunbeds, pavilions and sun shades, others are used for camping and picnics. Beside the anthropogenic influence, Yaniklar and Akgöl represent a good nesting site with flat and sandy zones in many parts of the beaches. In 2016, 27.3% of all emergences of female turtles led to successful nesting. In five areas, hardly used by humans, a concentration of nests into so-called "hotspots" was recorded.

INTRODUCTION

In the Mediterranean Sea, two species of nesting sea turtles can be found: The Loggerhead turtle (*Caretta caretta)* and the Green turtle (*Chelonia mydas*).

Caretta caretta is listed as vulnerable by the IUCN (International Union for Conservation of Nature and Natural Resources) and under protection of CITES, the "Convention on International Trade in Endangered Species of wild Fauna and Flora" (Broderick and Godfrey 1996). Although this area is designated as a "Special Protected Area" (since 1988) sea turtles are facing increasing threats against their survival. This is reflected in a decline in the numbers of nests (e.g. Türkozan 2006; Ilgaz et al. 2007, Lambropoulos et al. 2015). Especially in some sections in Yaniklar, sea turtle nesting sites compete with tourism facilities. Areas next to bars or hotels are often flooded with light: people celebrate beach parties and leave a lot of waste behind on the beach at night. At daytime the beach is used for relaxing on sunbeds and pavilions or doing watersports. Another risk for nests is the shadow of sun shades and the compression or removal of the sandy substrate by vehicles.

Female loggerhead turtles prefer sandy substrate and silent beaches, where nothing disturbs them. The best conditions are a flat bank without any objects or lights on the beach. Sunbeds, wooden paths, carpets or pavilions hinder them from finding the best location for the nest. Loggerhead turtles nest on beaches located on eastern basin, such as Fethiye (Miller, 2003). The coastline of Fethiye consists of three nesting beaches: Çaliş, Yaniklar and Akgöl, with a total length of about 7 km. Yaniklar beach starts with „Small beach" (Fig. 3), followed by a part with a wide sandy area behind a zone with pebbles, between the "Deniz Incisi Restaurant" and the new (2015) „Barut Hotel" (Fig. 4). This is followed by a long natural section with a reed belt in the backland (Figs. 5-6). At the end of this beach section are two camps, two major hotels (Majesty Club Botanica, Majesty Club Tuana, Fig. 7) and a lodge (Yonca Lodge). Akgöl beach starts with a part between Kargi River and Karaot Buffet, where the beach is covered mostly by pebbles, followed by a sandy section, with sunbeds in front and Karaot buffet (Fig. 9). The substrate in the part after Karaot Buffet is not very well fitting for sea turtle nesting, but the last section of Akgöl, called "Karaot beach", shows good conditions (Fig. 10).

Every year since 1994, the "Sea Turtle Field Course" conducted by the University of Vienna under the guidance of a cooperating university in Turkey has been monitoring these three beach sections. In the time from June to mid-September 2016, students from Vienna and Pamukkale University collected data on nests, tracks, temperature, adult female and hatchlings. A second aim was to observe the anthropogenic disturbances facing Loggerhead turtles. In 2015 a significant depredation of nests was reported in Yaniklar; this trend was again evident in 2016.

MATERIALS AND METHODS

This year, all the students and volunteers lived together in a camp in Çaliş. Two groups, each consisting of two to three people per shift worked and monitored on three different beach sections. To lower the risk of stepping on or disturb hatchlings in the darkness, the night shifts stopped when the first hatchlings emerged from the nest. Some parts in Yaniklar are natural, except the parts next to bigger hotels and bars, which light up the beach with artificial lights. A fieldbook was used in every shift to record data and a backpack with the tools we needed for measuring, protecting and locating the nest.

Night shift

The nightshift started at 10 p.m. The main aim was to observe adult female Loggerhead turtles. Depending on the number of adults we discovered, the time we returned to the camp changed. As soon as the first nest hatches, the night shift was stopped. In Yaniklar nest number Y48 on 17 July and in Akgöl nest number AS16 on 10 July. From 10 to 17 July, the starting point was at the Majesty Tuana Hotel, because of the first hatching nest in Akgöl. After the night shifts stopped in Yaniklar, nests on light polluted positions were controlled continuously during their hatching time. To make sure that no female was missed, the beach has to be partolled on the whole width: starting with one person on the waterline, one in the middle and one next to the vegetation. This system was used to get the maximum possible overview in the darkness. The team started at Akgöl hill and followed the coast to Yaniklar “Small Beach” next to Çaliş Tepe, where the shift stopped and returned to the camp. By fixed hand signals, every person in the team knew their assigment and what to do when an adult turtle was encountered at the beach walk. When somebody spotted a turtle, that person kneeled down so that the others could recognize that a turtle was on the beach. The whole team waited until the female finished laying her eggs, closed the egg chamber and finished the camouflage. Each working step is clear: one person did the measurements, one person noted the data and the other held the animal and the turlte was checked for a tag. If no tag was found, one person kneeled on the left side of the turtle, between the flippers and another tagged the turtle on the trailing edge of a front flipper. This strategy should ensure that the procedure is short and the turtle is minimally stressed. For the straight carapace length and width (SCL/SCW) a wooden sliding caliper was used, and for the curved carapace length and width (CCL/CCW) a tape measure.

Morning shift

Yaniklar group started the shift early at 5 a.m. because of walking from the base camp to the starting point of Yaniklar beach. From the starting point “small beach”, the route continued to the end of Akgöl Beach. Later in the summer the team postponed the begin of the shift according to a later sunrise. Normally the shift ended around 10 a.m., depending on how much work there was to do. In the morning shift the patrol also split up in three lines on the beach, one at the vegetation line, one in the middle, one at the waterline, to get the best overview of the beach. The aim was to discover new nests, adult and hatchling tracks, depredation, hatchlings or disturbance factors. Toward the end of the project, it was not necessary to look for adult tracks because nesting stopped. Then, only the known nests were controlled.

The equipment consists of a 50-m-long and a 1-m-long measuring tape, the field books, a metal stick called shish to test the sand and material to mark the nest. A good teamwork is always necessary for a quiet and smooth schedule.

When an adult track was discovered, measurements started with the total track length, internal and external track width (Fig. 21). The shape and the direction of the track were scetched in our field books and body pits and swimming movements were marked. Body pits and swimming movements are created when a turtle tests the substrate on the beach (e.g. hard or soft, sandy, or pebbly and stony. After they close their egg chamber, Loggerhead turtles try to hide their nest. This “camouflage” involves throwing sand with their flippers. When a camouflage was found, we tested the resistance of the sand with a thin metal rod (so-called shish).

Located nests were marked in different ways. The easiest way of marking a nest is laying stones in a half-circle on the landward side of the nest and putting some sticks in the ground next to it (Fig. 22). In touristically used sections the nests were covered with metal cages to ensure that visitors cannot destroy the eggs with sunbeds, umbrellas or towels. Critical nests, for example those exposed to strong light pollution, were also caged with all sides closed, so the hatchlings could be retained. The prerequisite is the regular control of these nests including letting the hatchlings into the sea and checking the position of the cage. Also the GPS positions were recorded (Figs. 2-10).

In 2016 many nests in Yaniklar were predated by foxes or jackals, so we positioned metal grids that served as predation cages on affected nests (Fig. 23). For further protection, we put prickly plants on the top and around the nest.

To find the egg chamber more easily, two small wooden sticks, tied together with a small rope, were dugged into the sand. One of these sticks should be exactly above the egg chamber. To re-locate the nest, we used the coordinates and the end of the shish to search for the string in

the sand.

In recording the nests, we used the designation A for Akgöl and Y for Yaniklar. S refers to a so-called secret nest, if the date the nest was laid was unknown. All the nests received successive numbers (for example AS1 or YS1).

When a hatching nest was found, the hatchling tracks were counted separately by two members of the team because they can be very confusing. We followed the direction of every track to determine whether every hatchling reached the sea and was not lost in the vegetation or misoriented elsewhere on the beach.

RESULTS

Nests

The total recorded number of the nests is 94, whereby 60 nests were located in Yaniklar (Figs. 2-7) and 34 nests in Akgöl (Figs. 8-10). 15 nests in Yaniklar were fully predated, and in two others some eggs were stolen. An interesting result was the few nests in front of Barut Hotel, namely only one, especially in comparison to the numbers of the last years (Figs. 5&20). This year, the total nest number is in the top thirds since the recordings start in 1994 (Fig. 1, Tab. 4). The yellow pins in the satellite photographs below show the nests, the green ones the important landmarks. The red arrow marks the new complex of Barut Hotel and the black squares mark the hotspots.

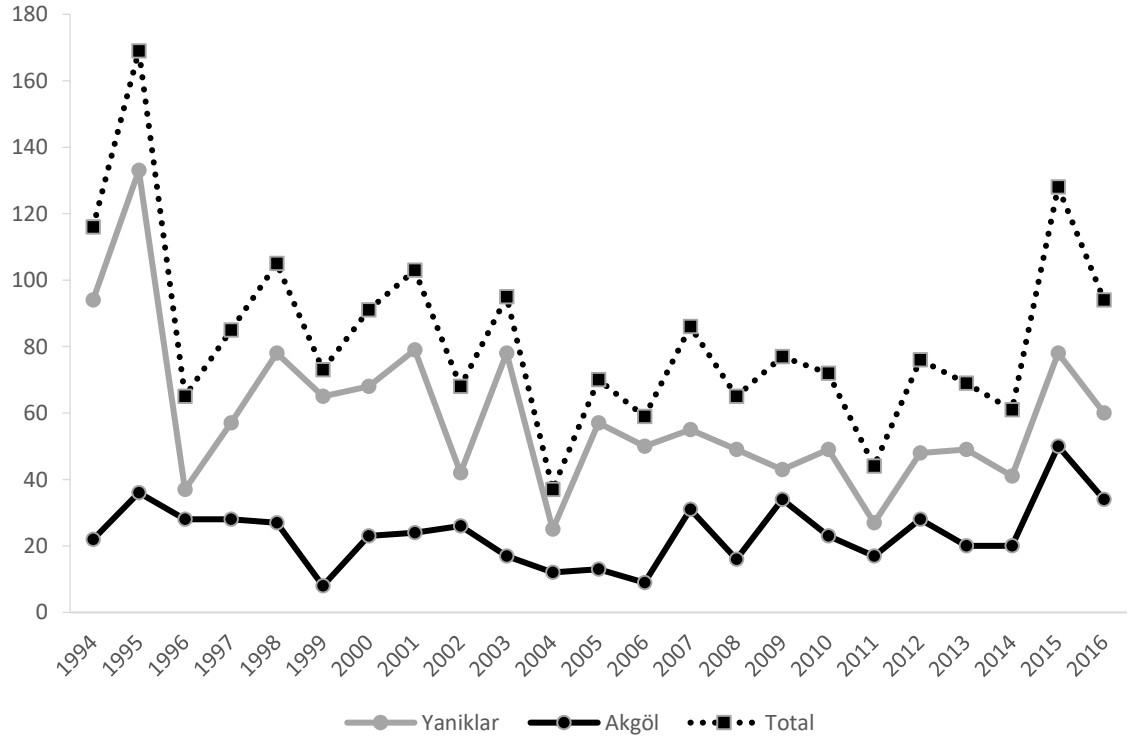

Fig. 1: Annual number of nests in Yaniklar and Akgöl from 1994 to 2016
Abb. 1: Anzahl der Nester in Yaniklar und Akgöl von 1994 bis 2016

Fig. 2: Overview of the coastline of Yaniklar. Yellow pins: nests. Source: Google Earth

Abb. 2: Der Verlauf der Küste in Yaniklar. Quelle: Google Earth

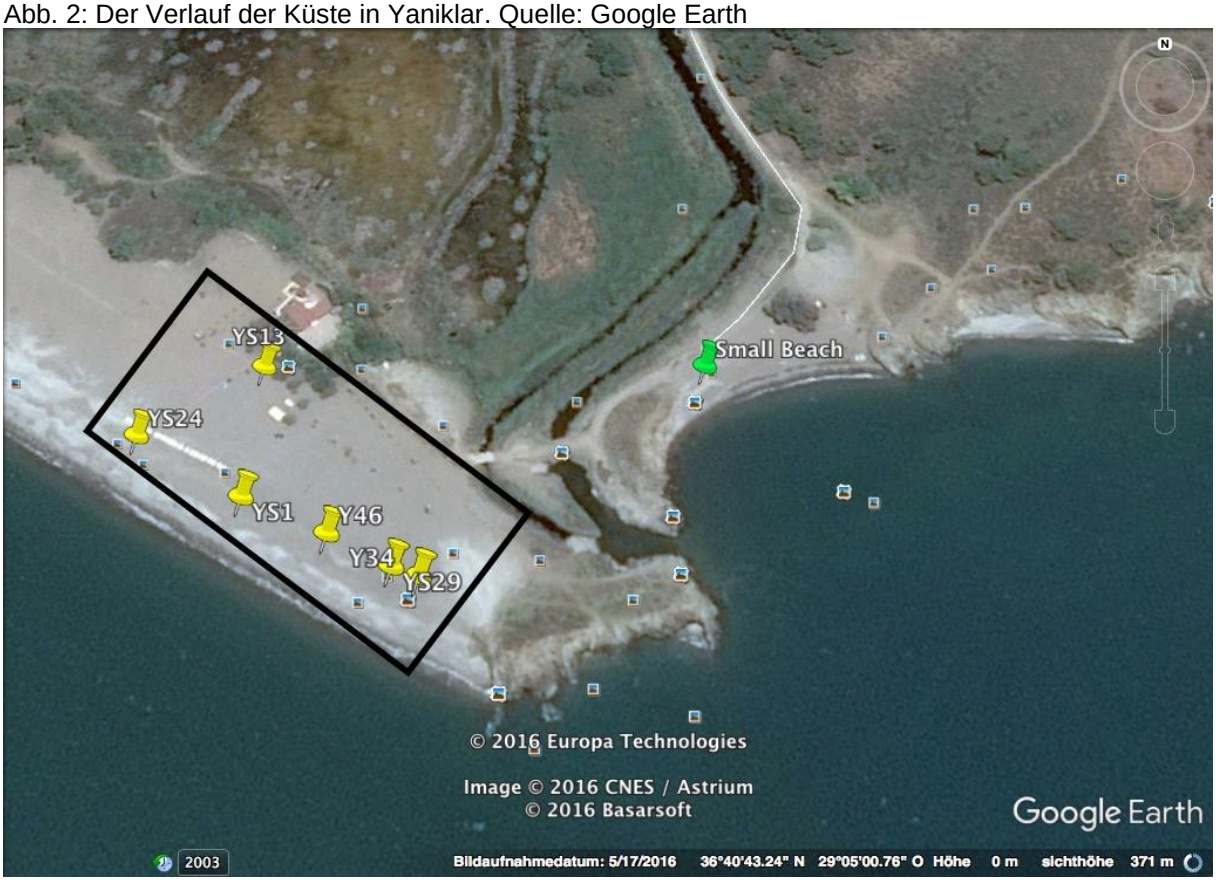

Fig. 3: Nest locations (yellow pins) at the beginning of Yaniklar beach; Source: Google Earth

Abb. 3: Die Verteilung der Nester am Beginn des Strandes in Yaniklar; Quelle: Google Earth

Fig. 4: Nest locations (yellow pins) at the beginning of Yaniklar beach; Source: Google Earth
Abb. 4: Die Verteilung der Nester am Anfang von Yaniklar und dem Barut Hotel; Quelle: Google Earth

Fig. 5: Nest locations (yellow pins) between Barut Hotel and the "Lonely Tree" landmark; arrow shows Barut Hotel, completed in 2015; Source: Google Earth
Abb. 5: Die Verteilung der Nester zwischen Barut Hotel und "Lonely Tree" in Yaniklar, Pfeil zeigt Barut Hotel, erbaut 2015; Quelle: Google Earth

Fig. 6: Nest locations (yellow pins) between "Lonely Tree" and Hotel Botanica in Yaniklar; Source: Google Earth
Abb. 6: Die Verteilung der Nester zwischen "Lonely Tree" und Hotel Botanica in Yaniklar; Quelle: Google Earth

Fig. 7: Nest locations (yellow pins) between Hotel Botanica and Majesty Tuana Hotel in Yaniklar; Source: Google Earth
Abb. 7: Die Verteilung der Nester zwischen Hotel Botanica und Majesty Tuana Hotel in Yaniklar; Quelle: Google Earth

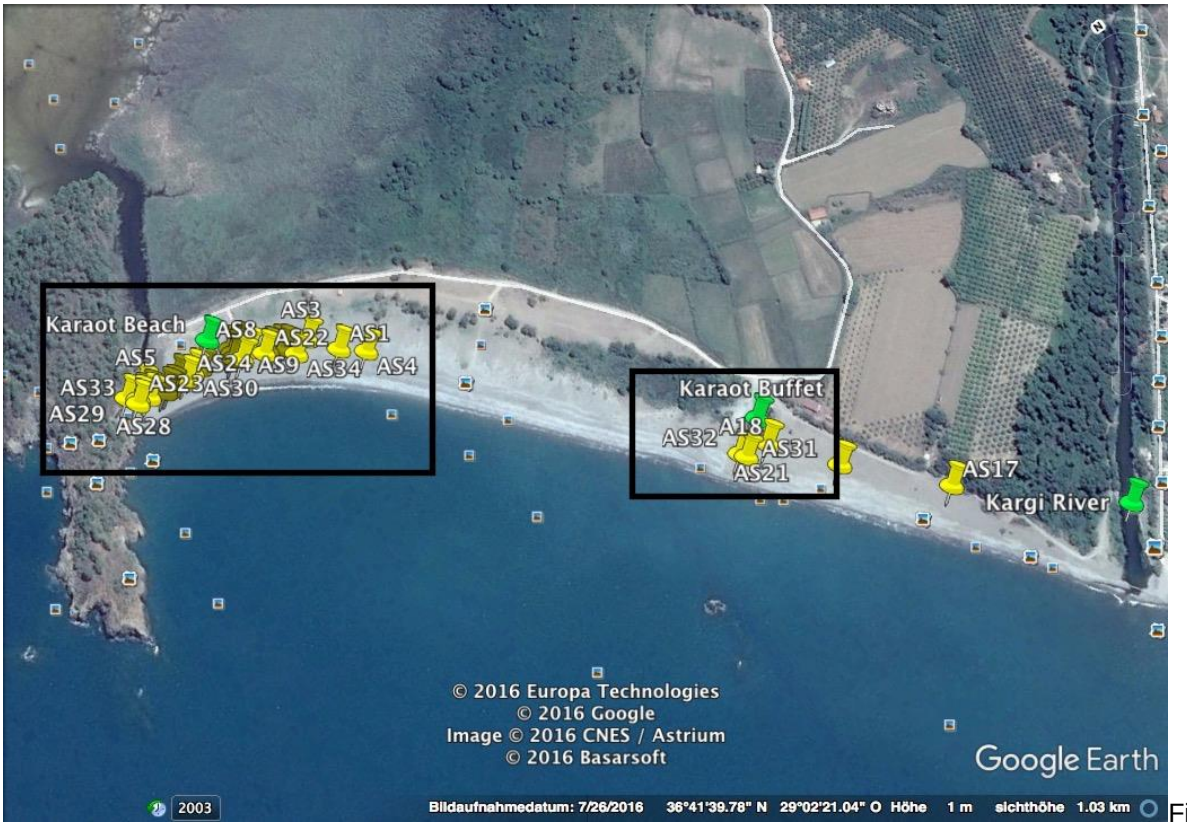

Fig. 8: The coastline in Akgöl. Note nesting hotspot on final section (left); Source: Google Earth
Abb. 8: Der Verlauf der Küste in Akgöl. „Hotspot“ im letzten Abschnitt des Strandes; Quelle: Google Earth

Fig. 9: Nest locations between Kargi River and Karaot Buffet in Akgöl; Source: Google Earth
Abb. 9: Die Verteilung der Nester zwischen dem Kargi Fluss und Karaot Buffet; Quelle: Google Earth

Fig. 10: Nesting hotspot at Karaot Beach in Akgöl; Source: Google Earth
Abb. 10: Die Verteilung der Nester am Karaot Beach in Akgöl; Quelle: Google Earth

In Yaniklar the average nest distance to the sea is 19.7m, with a standard deviation of ±10.15m. This can be subdivided into a 1.9m (±1.17) wet zone, 2.4m (±1.39) moist zone and 15.1m (±10.1) dry zone (Figs. 11-14). In Akgöl the average nest distance to sea was 18.7m (±9.17), whereby the wet zone makes up 2.5m (±1.55), the moist zone 3.2m (±2.62) and the dry zone 13.1m (±8.29) (Figs. 11-14).

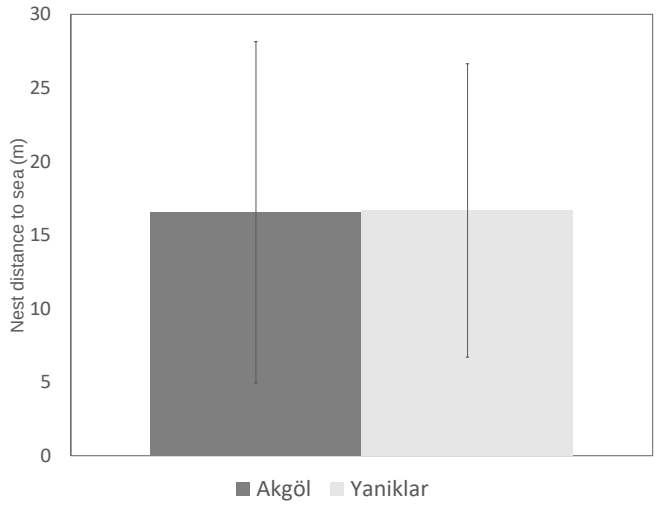

Fig. 11: Average nest distance to sea in Yaniklar and Akgöl with standard deviation
Abb. 11: Mittlere Distanz vom Nest zum Meer in Yaniklar und Akgöl mit Standardabweichung

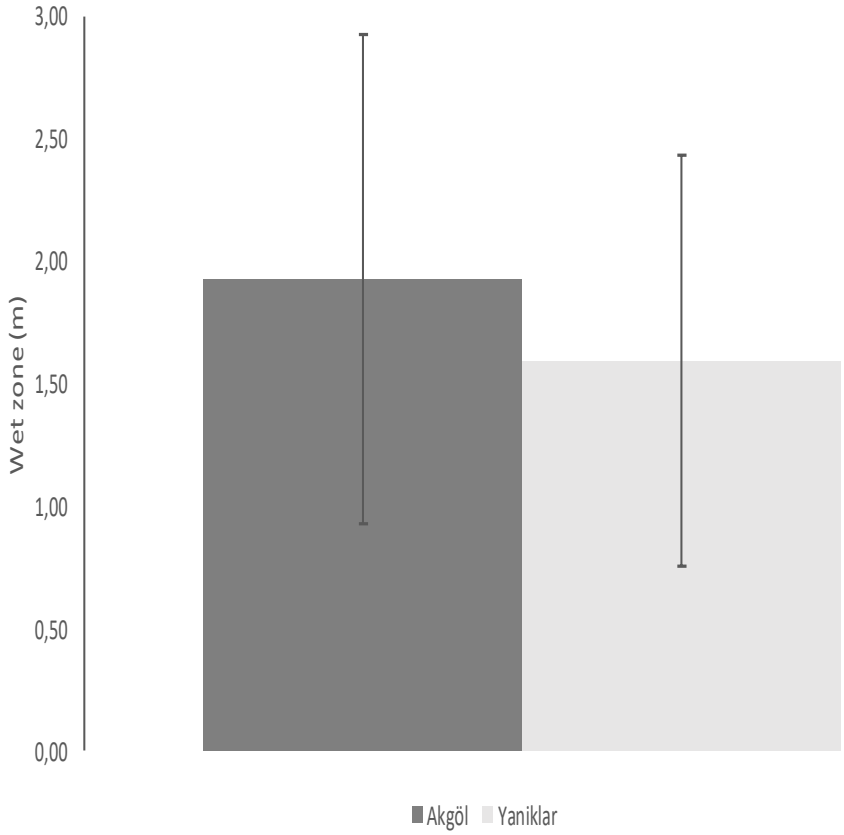

Fig. 12: Average length of wet zone in Yaniklar and Akgöl with standard deviation
Abb. 12: Mittlere Länge der nassen Zone in Yaniklar und Akgöl mit Standardabweichung

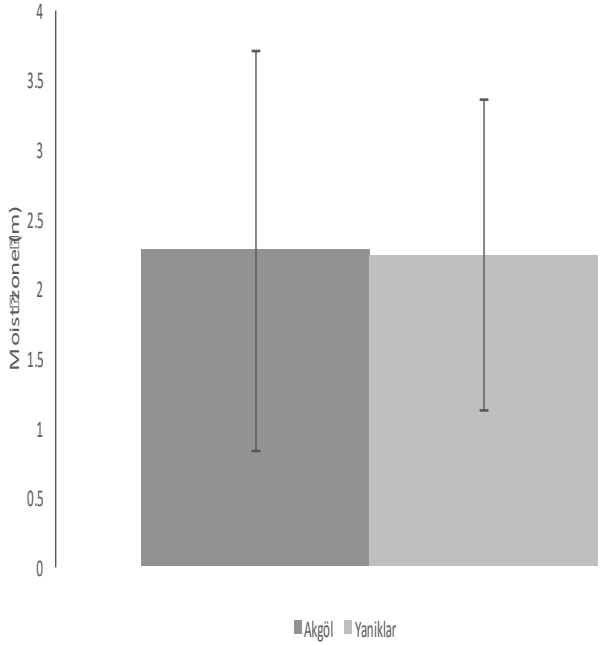

Fig. 13: Average length of moist zone in Yaniklar and Akgöl with standard deviation
Abb. 13: Mittlere Länge der feuchten Zone in Yaniklar and Akgöl mit Standardabweichung

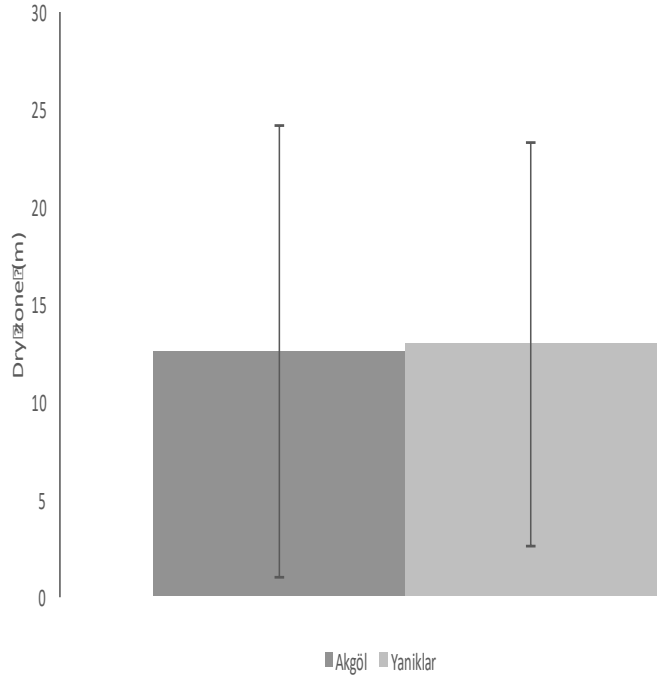

Fig. 14: Average distance of dry zone in Yaniklar and Akgöl with standard deviation
Abb. 14: Mittlere Länge der trockenen Zone vom Meer zum Nest mit Standardabweichung

Tracks

The sea turtle team counted 51 adult turtle tracks in Yaniklar and 15 in Akgöl, yielding a total amount of 66 tracks - 18 tracks led to successful nesting (Fig. 15, Tabs. 1-2). The percentage of successful nesting in Akgöl (33.3%) was somewhat higher than in Yaniklar (25.9%), averaging 27.3% for both stretches. The average total track length in Yaniklar is 35.7m (±23.12), in Akgöl 35.9m (±23.94) (Fig. 16). In Yaniklar we found 28 tracks with body pits and 12 tracks with swimming movements (Fig. 17, Tab. 9). In Akgöl, 8 tracks, body pits were recorded; two tracks exhibited swimming movements, respectively (Fig. 17, Tab. 10).

Tab. 1: Emergence data of adults with successful nesting in Yaniklar
Tab. 1: Landgänge von Adulten mit erfolgreichem Nistvorgang in Yaniklar

Date	**Track number**	**Total track length**	**External track width**	**Farthest distance to sea**	**Control**	**Dry**	**Moist**	**Wet**	**Nest number**
02.07.	TY1	34.9	0.57	10.2	10.2	4.4	3.6	2.2	YS31
02.07.	TY2	33.1	0.66	17.2	17.2	13	3	1.2	Y30
02.07.	TY3	39.6	0.78	17.3	17.3	11.4	3.4	2.5	YS29
04.07.	TY10	48.6	0.74	17.9	17.9	15.3	1.7	0.9	Y33
06.07.	TY29	38.7	0.61	17.9	17.9	12.3	3.6	2	Y34
08.07.	TY32	21.3	0.64	9.8	9.8	5.5	3.2	1.1	Y38
08.07.	TY33	15.8	0.57	7.9	7.9	4.1	2.6	1.2	Y39
09.07.	TY36	44.3	0.88	20.3	20.3	18.3	0.7	1.3	Y41
13.07.	TY39	x	x	11.1	11.1	9	1	1.1	Y42
14.07.	TY41	34.9	0.49	13.8	13.8	11.5	1.1	1.2	Y45
16.07.	TY42	144.9	0.61	69.5	69.5	66.1	2	1.4	Y47
16.07.	TY43	33.8	0.8	14.7	14.7	10.7	3.1	0.9	Y46
20.07.	TY48	97.5	0.54	38.7	38.7	34.9	1.8	2	Y49

Tab. 2: Emergence data of adults with successful nesting in Akgöl
Tab. 2: Landgänge von Adulten mit erfolgreichem Nistvorgang in Akgöl

Track number	Total track length	External track width	Internal track width	Farest distance to sea	Control	Dry	Moist	Wet	Nest number
05.07.	AT4	34.5	0.54	15.7	15.7	11.6	0.8	3.3	A12
05.07.	AT5	21.5	0.59	7.1	7.1	3.6	1.8	1.7	A13
06.07.	AT6	49.7	55	11.8	11.8	6.4	3.9	1.5	A14
07.07.	AT7	19.4	57	6.3	6.3	4.5	1.3	0.5	A15
22.07.	AT14	12.8	67	9.8	9.8	6.3	1.5	2	A18

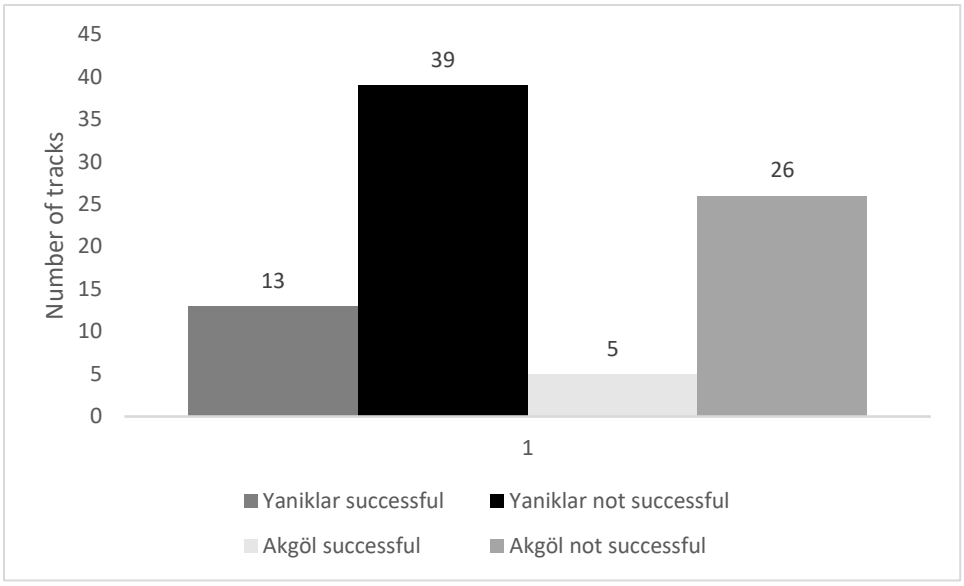

Fig. 15: Number of tracks separated into successful and unsuccessful nesting in Yaniklar and Akgöl
Abb. 15: Anzahl der Tracks getrennt in erfolgreiche und nicht erfolgreiche Nistversuche in Yaniklar und Akgöl

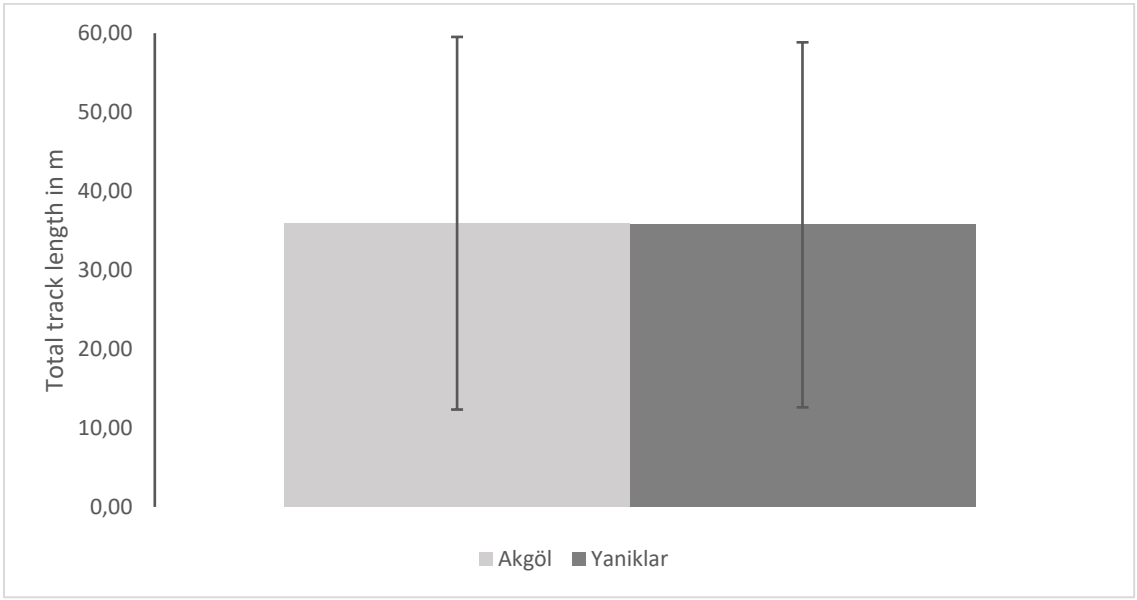

Fig. 16: Average total track length in Yaniklar and Akgöl
Abb. 16: Durchschnittliche Spurenlänge von Adulten in Yaniklar und Akgöl

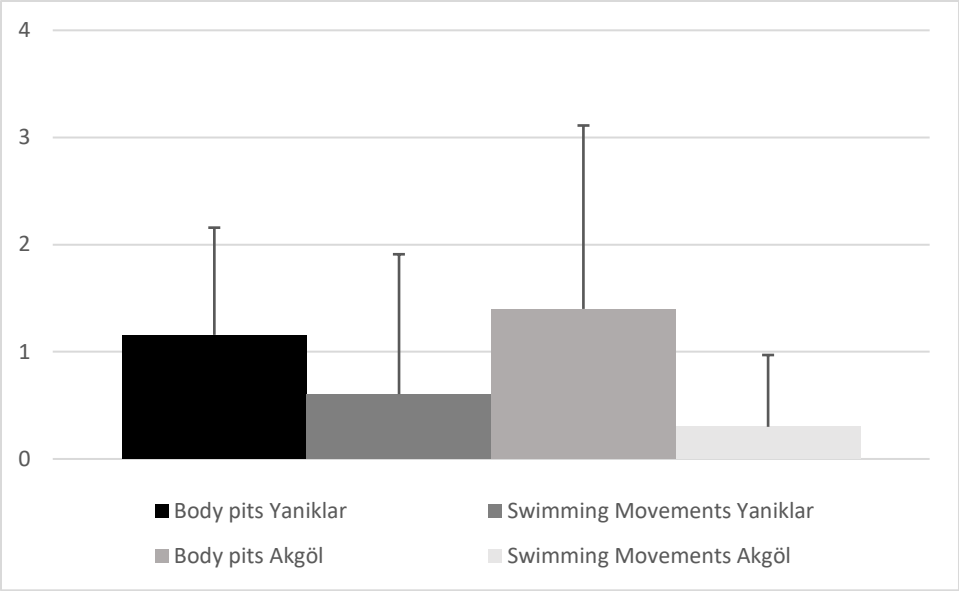

Fig. 17: Average number of body pits and swimming movements in Yaniklar and Akgöl
Abb. 17: Mittlere Anzahl an body pits in Yaniklar und Akgöl mit Standardabweichung

Adults

In the night shifts the team encountered five adult females and took carapace measurements of three animals. Only one of them made a successfully hatching nest, three females were tagged. In comparison to 2015, when the team spotted 20 adult female loggerhead turtles, the number of observed turtles is lower than the year before. Only one turtle already had a tag number (TR-C2202); she was tagged years before by our Turkish colleges in Çaliş. Also four tracks were measured when the sea turtle was spotted (TY9, TY11, TY39, TY44) (Tab. 3).

The average carapace size of the four measured individuals is 69.5cm (± 9.18) SCL, 49.7cm (± 7.63) SCW, 70.6m (± 7.79) CCL and 53.7cm (±30.69) SCW (Fig. 18).

Tab. 3: Carapace size of four adult female turtles in Yaniklar
Tab. 3: Größe des Carapax von *Caretta caretta* in Yaniklar

Track number	Tag Number	SCL	SCW	CCL	CCW	Nest distance to sea	Dry	Moist	Wet	Nest Number
TY9	x	67.00	44.00	67.00	65.00	12.8	12.42	0.22	0.16	
TY11	TR-C2202	69.00	47.00	73.00	63.00	26	23.7	1.7	0.6	
TY39	TR-Y0341	x	x	67.00	0.58	11.1	9	1	1.1	Y42
TY44	TR-Y0342	60.00	47.00	63.00	60.00	x	x	x	x	
	TR-Y0317	82	61	83	80					

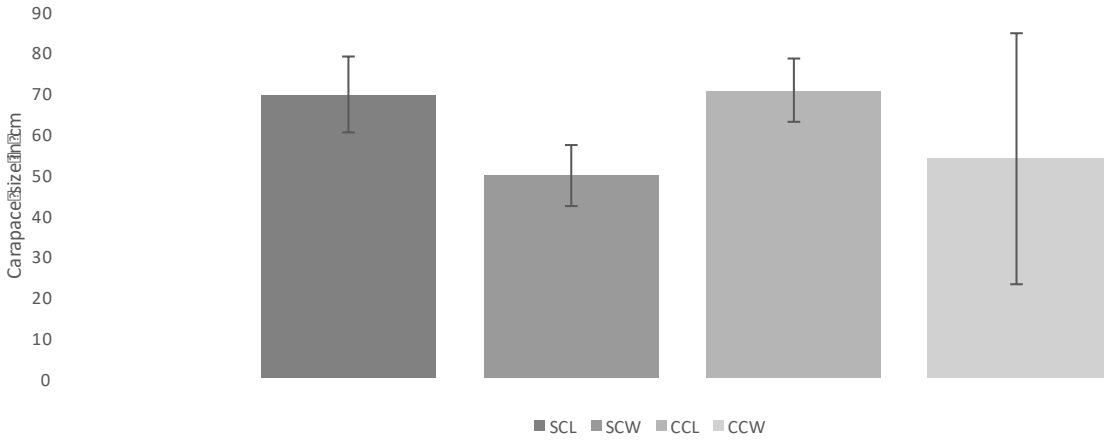

Fig. 15: Average carapace size (straight and curved measurements)
Abb. 15: Durchschnittliche Größe des Carapax

DISCUSSION

For sea turtles the whole nesting process is very stressful and costs a high amount of energy. Sea turtles do not nest every year. In 1988, C. Kenneth Dodd wrote that they have a reproduction break of 1 or 2 years, i.e. a 2-year cycle or a 3-year cycle. The peak in 2015 with 128 nests (Svalina & Werner 2015), followed by 94 nests in 2016, referring to Fig. 1, show clear fluctuations in the total number of nests. For example, the peaks come every second year, which reflects a 2-year-cycle (Fig. 1). In the next years, the data will tell us more about the overall pattern. For example, is the general declining trend shown by Ilgaz (2005) contuinuing or has this trend been stopped or even reversed?

These fluctuations and the potentially ongoing decline in annual nest numbers are probably also influenced by another factor, namely anthropogenic disturbance. Anthropogenic influences on sea turtle nesting sites are a huge problem in the conservation and protection of sea turtles. Although Fethiye has been declared as a "Special Protected Area" (SPA), Yaniklar and Akgöl beach face trouble in this perspective (Fig. 5, Fig. 7). In the areas in front of Barut Hotel, Majesty Club Botanica, Yonca Lodge, Lycia Botanica in front of the Karaot Buffet and two camps, the beach is occupied by sunbeds, pavilions and parasols. During the daytime the water is used for watersports, and at night people celebrate parties on the beach. All these factors promote another problem, waste, light and noise pollution. When the turtles emerge from the water at night, they often got disturbed by people. This is one potential reason for the differences in the number of unsuccessful tracks between Yaniklar (25.95%) and Akgöl (33.33%) (Figs. 15-17).

An interesting result of the nest data in 2016 is that there was only 1 nest (YS48) in front of Barut Hotel, which was opened in 2015 (Fig. 5). In comparison to 2015 (Fig. 20), where 13 nests were recorded, the 2016 value is telling. In the main tourism season, the sand becomes compressed by machines in some areas (Fig. 24). Such hardened substrates do not allow turtles to dig a deep egg chamber. Moreover, the hatchlings have problems to emerge from nests dug into compressed sand.

The results showed 18 tracks with an average number of 1.1 (±1.00) body pits in Yaniklar and 12 with an average number of 0.6 (±1.30) swimming movements (Fig. 17, Tab. 9). In Akgöl 12 tracks with an average of 1.4 (±1.73) body pits and 2 with an average of 0.3 (±0.67) swimming movements (Fig. 17, Tab. 10). Loggerhead turtles make body pits or swimming movements to test the substrate at a position where they want lay their eggs. If the ground is too hard or there are too many pebbles and stones, the females return to the sea without laying the eggs.

Referring to the conditions on the beach, e.g. fine sand instead of pebbles and stones, the nests concentrate in so identified hotspots, whereby five could be counted. Compared to the year 2015, the hotspots are similar, except the spot in front of Barut Hotel, where only one nest was laid in 2016 – compared to 13 in 2015 (Svalina & Werner 2015). Also in 2014, similar hotspots were identified (Bürger & Kriegl 2014). Yaniklar contains several such hotspots: at the beginning of the beach are 6 nests and in a following part 4. Between these two parts, there are sunbeds, where one nest was laid (Fig. 3 & 4). In front of the Barut Hotel, only one nest was found in 2016 (Fig. 5). Before “Lonely tree”, the beach is not suitable for sea turtle nesting activities, namely characterized by a steep bank with pebbles at the waterline. Through sand removals in the last years, the sandy line next to the vegetation, where sea turtles prefer to lay their eggs, has gotten thinner or even been lost entirely. Figure 6 shows the next part of Yaniklar, a long coast with a slight U-shape, in the back is an extensive natural wetland. In front of this wetland is a wide sandy line, where many nests are located (Fig. 6). Although the next section is used by hotels and camps, there are several nests: YS57, Y38, YS23, YS3, Y33, Y39 (Fig. 7). These nests were protected with metal cages.

The substrate in the section after Kargi River is hard and covered mostly by stones, in front of Karaot Buffet fine sand. (Fig. 9). The results showed two hotspots in Akgöl: the first one in front of Karaot Buffet with 3 nests in front and the second at Karaot Beach, with 24 nests (Fig. 8). Between the first and the second hotspot is an area with pebbles, followed by sandy parts. Although Karaot beach is used for swimming and picnics, there are good conditions for sea turtle nests: a wide, soft, sandy beach zone, this reflects in the high density of nests there. (Fig. 10). During the winter, a small river enters the sea there, but in summer the river bed is typically

merely moist. One nest was laid there A20 (Fig. 10), but this nest was wet and hatched only one day.

The high densities of nests in the five “hotspots” show that the turtles need such quiet, natural beach sections to lay their eggs. If these beach sections get smaller or become lost, e.g. through sand removal or touristic usage, the percentage of successful nesting will decrease.

The monitoring work is by no means done, although the efforts of the “*Caretta caretta* team” have shown some successes. Further sensibilisation of tourists and locals for the protection and conservation of loggerhead turtles is required, e.g. people took the marking-stones of nest Y41 away three times. It is hard to find solutions with hotels and bars, but if they are willing to make smallcompromises, they could easily satisfy the tourists and the turtles, e.g. at night by reducing the light and moving those objects to the back of the beach that hinder sea turtles from finding a suitable nesting place. More signs should be put up to increase the awareness of tourists; barricades shgould be installed to ensure that nobody drives with cars on the beach. All in all, the *Caretta caretta* nesting year 2016 was successful, with 94 nests - the third best value since the beginning of monitoring in Yaniklar and Akgöl.

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APPENDIX

Fig. 16: The coastline of Yaniklar and Akgöl in 2014, the arrow marks the place where Barut Hotel was built in 2015. The black squares mark five hotspots in 2014.Source: Bürger & Kriegl 2014, Google Earth

Abb. 16: Die Küste von Yaniklar und Akgöl 2014, der Pfeil markiert die Fläche auf der 2015 das Barut Hotel gebaut wurde. Die schwarzen Vierecke zeigen 5 Hotspots im Jahr 2014. Quelle: Bürger & Kriegl 2014, Google Earth

Fig. 17: Nest locations (red stars) in 2015 on future (Barut Hotel property

Abb. 17: Verteilung der Nester rund um das noch nicht eröffnete Barut Hotel 2015

Fig. 18: The team measuring the nest distance to sea
Abb. 18: Das Team beim Vermessen der Nestdistanz zum Meer

Fig. 19: A nest marked with stones. The nest number is written on one or more stones,
Abb. 19: Ein mit Steinen markiertes Nest. Die Nestnummer wird auf einen oder mehrere Steine geschrieben.

Fig. 23: Metal grid to protect the nest from predation
Abb. 23: Metallgitter zum Schutz vor Prädation

Fig. 24: The sand at Barut Hotel is smoothened and often watered daily, making it difficult to locate sea turtle tracks and potential nests.
Abb. 24: Das Ergebnis der regelmäßigen Verdichtung des Sandes

Tab. 4: Annual number of nests from 1994 to 2016 in Yaniklar and Akgöl
Tab: 4: Anzahl der Nester in Yaniklar und Akgöl von 1994 bis 2016

Year	Yaniklar	Akgöl	Total
1994	94	22	116
1995	133	36	169
1996	37	28	65
1997	57	28	85
1998	78	27	105
1999	65	8	73
2000	68	23	91
2001	79	24	103
2002	42	26	68
2003	78	17	95
2004	25	12	37
2005	57	13	70
2006	50	9	59
2007	55	31	86
2008	49	16	65
2009	43	34	77
2010	49	23	72
2011	27	17	44
2012	48	28	76
2013	49	20	69
2014	41	20	61
2015	78	50	128
2016	60	34	94

Tab. 5: Overview of the track data, TY= Track Yaniklar
Tab. 5: Übersicht pber die Vermessung der Spuren, TY = Track Yaniklar

Date	Track number	Total track length	External track width	Internal track width	Number of body pits	Swimming movement	Nest dist. to sea	Dry	Moist	Wet
02.07.	TY1	34.90	0.57	x	x	x	10.2	4.4	3.6	2.2
02.07.	TY2	33.10	0.66	x	x	x	17.2	13	3	1.2
02.07.	TY3	39.60	0.78	x	x	x	17.3	11.4	3.4	2.5
02.07.	TY4	32.20	0.57	0.18	0	0	16.5	11.3	3.8	1.4
02.07.	TY5	25.40	0.63	0.23	1	0	16.2	10	2	4.2
02.07.	TY6	20.00	x	x	1	0	9.5	4.1	2.1	3.3
02.07.	TY7	29.60	0.61	0.18	1	0	14.8	8.7	2.1	4
02.07.	TY8	37.50	0.56	0.14	0	0	13.5	x	x	x
03.07.	TY9	25.16	0.53	0.17	3	0	12.8	12.42	0.22	0.16
04.07.	TY10	48.60	0.74	x	x	x	17.9	15.3	1.7	0.9
04.07.	TY11	58.70	0.61	0.21	0	2	26	23.7	1.7	0.6
04.07.	TY12	14.80	0.55	0.16	0	0	14.8	9.6	3.8	1.4
04.07.	TY13	58.70	0.68	0.21	0	2	26	23.7	1.7	0.6
04.07.	TY14	46.60	0.60	0.21	0	1	22.4	17	3.5	1.9
04.07.	TY15	36.60	0.90	0.30	1	0	17	12.3	3	1.7
04.07.	TY16	5.40	0.50	0.10	0	0	1.4	0	1.4	0
04.07.	TY17	25.60	0.57	0.19	3	1	15.7	11.5	1.7	2.5
04.07.	TY18	43.90	0.61	0.20	1	0	20	16	2.8	1.2
04.07.	TY19	70.40	0.50	0.16	3	3	27	24.7	1.3	1
04.07.	TY20	9.70	x	x	1	0	8.7	5.6	1.2	1.9
04.07.	TY21	40.00	0.65	0.18	1	0	15.4	11.5	3.1	0.8
04.07.	TY22	21.80	x	x	1	0	21.8	19.7	1.4	0.7
05.07.	TY23	48.60	0.49	0.19	0	7	23.2	18.5	2.7	2
05.07.	TY24	53.00	0.62	0.25	2	1	20.8	13.6	4.7	2.5
05.07.	TY25	29.00	0.61	0.23	2	0	11.9	7.6	2.3	2
05.07.	TY26	14.90	0.61	0.24	1	1	6.9	3.7	1.3	1.9
05.07.	TY27	16.70	0.64	0.19	0	1	9.1	3.3	2	2.8
05.07.	TY28	23.80	0.60	0.22	0	0	10.9	6.2	2.7	2
06.07.	TY29	38.70	0.61	x	x	x	17.9	12.3	3.6	2
06.07.	TY30	11.30	0.65	0.18	1	1	9.7	5.1	3.1	1.5
07.07.	TY31	16.50	0.65	0.25	1	0	8	3.2	3.5	1.3
08.07.	TY32	21.30	0.66	x	x	x	9.8	5.5	3.2	1.1
08.07.	TY33	15.80	0.66	x	x	x	7.9	4.1	2.6	1.2
08.07.	TY34	39.60	0.66	0.20	2	1	19.4	16.9	1.6	0.9
08.07.	TY35	24.60	x	0.21	2	2	16.8	11.4	4.2	1.2
09.07.	TY36	44.30	0.60	x	x	x	20.3	18.3	0.7	1.3
09.07.	TY37	41.10	0.60	0.29	4	0	10.8	8.1	0.8	1.9
09.07.	TY38	36.60	0.60	0.23	1	0	16.4	14.4	0.5	1.5
12.07.	TY40	30.30	0.59	0.13	1	0	14.1	10.8	2	1.3
13.07.	TY39	x	0.59	x			11.1	9	1	1.1
14.07.	TY41	34.90	0.59	x	x	x	13.8	11.5	1.1	1.2
16.07.	TY42	144.90	0.59	x	x	x	69.5	66.1	2	1.4
16.07.	TY43	33.80	0.59	x	x	x	14.7	10.7	3.1	0.9
16.07.	TY44	x	0.58	0.15	1	0	x	x	x	x
16.07.	TY45	44.60	0.58	0.25	2	0	20.6	18.1	1	1.5
16.07.	TY46	24.00	0.58	0.15	2	0	16.8	15.3	0.5	1
17.07.	TY47	18.00	0.58	0.17	1	0	9	7.1	1	0.9
20.07.	TY48	97.50	0.58	x	x	x	38.7	34.9	1.8	2

Date	Track number	Total track length	External track width	Internal track width	Number of body pits	Swimming movement	Nest dist. to sea	Dry	Moist	Wet
21.07.	TY49	46.90	x	0.15	2	0	22.7	20.5	1.2	2
25.07.	TY50	21.40	1.65	0.20	1	0	11	6.1	3.5	1.4
31.07.	TY51	20.10	x	0.15	1	0	10.1	4.7	3.3	2.1

Tab. 6: Emergences of adult turtles in Yaniklar, TY= Track Yaniklar, Y= Yaniklar
Tab. 6: Landgänge von Adulten in Yaniklar; TY = Track Yaniklar

Track number	Tag Number	SCL	SCW	CCL	CCW	Furthest distance or Nest distance to sea	Dry	Moist	Wet	Nest Number
TY9	x	67,00	44,00	67,00	65,00	12,8	12,42	0,22	0,16	
TY11	TR-C2202	69,00	47,00	73,00	63,00	26	23,7	1,7	0,6	
TY39	TR-Y0341	x	x	67,00	0,58	11,1	9	1	1,1	Y42
TY44	TR-Y0342	60,00	47,00	63,00	60,00	x	x	x	x	

Tab. 7: Overview of the track data in Akgöl, AT= Akgöl Track
Tab. 7: Übersicht über die Vermessung der Spuren, AT = Akgöl Track

Track number	Total track length	External track width	Internal track width	Number of body pits	Swimming movement	Furthest distance to sea	Dry	Moist	Wet
AT1	13	55	19	1	1	5,9	0,4	2,3	3,8
AT2	59	70	20	1	2	28,4	23	3	2,4
AT3	43,1	44	13	1	0	16,3	13	1,9	1,4
AT4	34,5	0,54	x	x	x	15,7	11,6	0,8	3,3
AT5	21,5	0,59	x	x	x	7,1	3,6	1,8	1,7
AT6	49,7	55	x	x	x	11,8	6,4	3,9	1,5
AT7	19,4	57	x	x	x	6,3	4,5	1,3	0,5
AT8	49,5	59	20	0	0	23,2	20,4	1,4	1,4
AT9	8,2	x	x	0	0	3	0,6	2,4	0
AT10	x	55	16	1	0	36,5	33,1	1,4	2
AT11	94	54	16	6	0	42,5	39	1,3	2,2
AT12	14,7	52	15	1	0	8,4	3,2	2,8	2,4
AT13	47,9	62	21	2	0	17,8	10,3	6,6	2,9
AT14	12,8	67	x	x	x	9,8	6,3	1,5	2
AT15	35,7	65	23	1	0	15,6	12,6	1,6	1,4

Tab. 8: Tracks with successful nesting in Akgöl, AT= Akgöl Track, A= Akgöl
Tab. 8: Tracks mit erfolgreicher Eiablage; AT= Akgöl Track, A= Akgöl

Track number	Total track length	External track width	Internal track width	Farest distance to sea	Dry	Moist	Wet	Nest number
05.07.	AT4	34.5	0.54	15.7	11.6	0.8	3.3	A12

05.07.	AT5	21.5	0.59	7.1	3.6	1.8	1.7	A13
06.07.	AT6	49.7	55	11.8	6.4	3.9	1.5	A14
07.07.	AT7	19.4	57	6.3	4.5	1.3	0.5	A15
22.07.	AT14	12.8	67	9.8	6.3	1.5	2	A18

Tab. 9: Overview of the number of body pits and swimming movements in Yaniklar, TY= Track Yaniklar
Tab. 9: Übersicht über die Anzahl an Bodypits und Schwimmbewegungen in Yaniklar, TY= Track Yaniklar

Date	Track number	Total track length	Number of body pits	Swimming movement
02.07.	TY4	32.20	0	0
02.07.	TY5	25.40	1	0
02.07.	TY6	20.00	1	0
02.07.	TY7	29.60	1	0
02.07.	TY8	37.50	0	0
03.07.	TY9	25.16	3	0
04.07.	TY11	58.70	0	2
04.07.	TY12	14.80	0	0
04.07.	TY13	58.70	0	2
04.07.	TY14	46.60	0	1
04.07.	TY15	36.60	1	0
04.07.	TY16	5.40	0	0
04.07.	TY17	25.60	3	1
04.07.	TY18	43.90	1	0
04.07.	TY19	70.40	3	3
04.07.	TY20	9.70	1	0
04.07.	TY21	40.00	1	0
04.07.	TY22	21.80	1	0
05.07.	TY23	48.60	0	7
05.07.	TY24	53.00	2	1
05.07.	TY25	29.00	2	0
05.07.	TY26	14.90	1	1
05.07.	TY27	16.70	0	1
05.07.	TY28	23.80	0	0
06.07.	TY30	11.30	1	1
07.07.	TY31	16.50	1	0
08.07.	TY34	39.60	2	1
08.07.	TY35	24.60	2	2
09.07.	TY37	41.10	4	0
09.07.	TY38	36.60	1	0
12.07.	TY40	30.30	1	0
16.07.	TY44	x	1	0
16.07.	TY45	44.60	2	0
16.07.	TY46	24.00	2	0

Date	Track number	Total track length	Number of body pits	Swimming movement
17.07.	TY47	18.00	1	0
21.07.	TY49	46.90	2	0
25.07.	TY50	21.40	1	0
31.07.	TY51	20.10	1	0

Tab. 10: Overview of the number of body pits and swimming movements in Akgöl, AT= Akgöl Track
Tab. 10: Übersicht über die Anzahl der Bodypits und Schwimmbewegungen bei Spuren in Akgöl, AT= Akgöl Track

Date	Track number	Total track length	Number of body pits	Swimming movement
02.07.	AT1	13	1	1
02.07.	AT2	59	1	2
04.07.	AT3	43.1	1	0
07.07.	AT8	49.5	0	0
08.07.	AT9	8.2	0	0
12.07.	AT10	x	1	0
12.07.	AT11	94	6	0
14.07.	AT12	14.7	1	0
21.07.	AT13	47.9	2	0
29.07.	AT15	35.7	1	0