

# THE NESTING SEASON OF ADULT *CARETTA CARETTA* AT ÇALIŞ BEACH IN 2016

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## KURZFASSUNG

Von 2. Juli bis 17. September 2016 fand das jährliche Meeresschildkröten-Projektpraktikum für die Erhaltung und den Schutz von *Caretta caretta* in Fethiye statt. Elf österreichische Studenten der Universität Wien arbeiteten zusammen mit türkischen Studenten der Pamukkale Universität um die gefährdete Art *Caretta caretta*, welche heuer als „vulnerable“ auf der Roten Liste gefährdeter Arten der IUCN gelistet wurde, zu schützen. Die Region Fethiye, welche in die drei Strände Çalış, Yanıklar und Akgöl unterteilt ist, gehört zu den dreizehn Hauptnistregionen von *Caretta caretta* in der Türkei und hat den Status einer „Special Protected Area“ (Gebiet mit besonderem Schutz). Rund die Hälfte des 2.5 m langen Strands von Çalış wird durch eine Promenade begrenzt, auf der sich eine Vielzahl an Hotels, Restaurants und Bars befindet. Dies führt zu einer massiven, anthropogen verursachten Störung der nistenden Meeresschildkröten und der Schlüpflinge. Das Monitoring Team patrouillierte den Strand in täglichen Nacht- und Frühschichten und hielt dabei nach weiblichen Meeresschildkröten, Spuren und später in der Saison nach Schlüpflingen Ausschau. Die Hauptaufgabe der Studenten lag darin, nistende Meeresschildkröten, Spuren und Nester zu vermessen, und Adulte und Schlüpflinge vor anthropogenen Einflüssen zu schützen. In dieser Nistsaison wurden neunzehn Nester von *Caretta caretta* auf dem Strand von Çalış gelegt, was unter der durchschnittlichen Anzahl an Nestern seit 1994 liegt. Zwölf Nester befanden sich auf dem Strandabschnitt vor der Promenade und hatten einen um 16% geringeren mittleren Abstand zum Meer im Vergleich zu den Nestern abseits der Promenade. Es wurden nur neun Kriechspuren von adulten Meeresschildkröten ohne Nest gefunden, was einem Nisterfolg von 68% entspricht. Die zwei an Land beobachteten weiblichen Meeresschildkröten wurden von türkischen Studenten markiert, um das Migrationsverhalten nachverfolgen zu können.

## ABSTRACT

From 2 July to 17 September 2016 the annual sea turtle field course for the conservation and protection of *Caretta caretta* took place in Fethiye. Eleven Austrian students from the University of Vienna worked together with Turkish students from Pamukkale University to protect the endangered species *Caretta caretta*, which has recently been classified as “vulnerable” on the IUCN’s Red list of threatened species. The area of Fethiye, which is divided

in the three beaches Çaliş, Yanıklar and Akgöl, is one of thirteen key nesting places of *Caretta caretta* in Turkey (İlgaz 2007) and has the status as a Special Protected Area. About the half of the 2.5-km-long Çaliş beach is bounded by a promenade with numerous hotels, bars and restaurants, what leads to a massive anthropogenic disturbance of nesting female turtles and on hatchlings. The monitoring team patrolled the beach in daily night and morning shifts, recording female nesting turtles, tracks, nest positions and emerging hatchlings later in the season. The main tasks of the students were to take measurements of adult turtles, tracks and nests and to protect nesting female turtles and hatchlings against anthropogenic impacts. In this nesting season, nineteen nests were laid by *Caretta caretta* on Çaliş beach, which is somewhat under the average number of nests since 1994. Twelve nests were located in the area in front of the promenade. Their mean distance to the sea was 16% lower than of nests offside the promenade. Only nine tracks without nests were found, which represents a nesting success of 68%. The two observed female turtles were both tagged by Turkish students in order to trace their migration behaviour and nesting intervals.

## INTRODUCTION

Today, there are seven species of sea turtles in the world's oceans. Until last year, all of them were classified as "endangered" on the IUCN's (International Union for Conservation of Nature and Natural Resources) Red list of threatened species. This year, *Caretta caretta* was downgraded from the status "endangered" to "vulnerable". The Mediterranean subpopulation is listed as "least concern", because the population size has slightly increased as a result of decades of intense conservation programs (Casale & Margaritoulis 2010). So the cessation of these programs would be followed by a population decrease. Importantly, this status still calls for ongoing monitoring.

All sea turtle species are also protected by CITES (Convention of International Trade of Endangered Species of Wild Fauna and Flora), the Bern Convention, where *Caretta caretta* is listed in annex II and IV of the FFH guidelines as a priority species with the need of special protection, and the United Nations Environment Program (UNEPWCMC) (Nagorzanski & Pifeas 2013). The reason for the decline of sea turtle populations are almost exclusively anthropogenic threats such as fisheries bycatch, boat strikes, consumption of plastic materials, entanglement in marine debris at sea, and coastal development such as beach restructuring, light pollution, noise and traffic on land (Casale & Margaritoulis, 2010, Camiñas 2004 ).

Two species of sea turtles nest in the Mediterranean Sea - *Caretta caretta* (loggerhead turtle) and *Chelonia mydas* (green turtle). The most frequented nesting sites of *Caretta caretta* are

located in Greece, Turkey and Cyprus, a lesser concentration is found in Tunis, Syria and Israel (Margaritoulis 2003). Fethiye is one of the 13 main nesting beaches in Turkey and has the status of a SEPA (Special Environmental Protected Area). Numerous anthropogenic problems face the three beaches of Fethiye, including degradation of sand, construction of new hotels, garbage, light pollution and sunbeds and sunshades (İlgaz 2007). Especially the 2.5-km long beach in Çaliş is affected by tourism, e.g. various hotels, shops, bars and restaurants along the promenade. The resultant light pollution, noise and human activity has a major impact on the nesting behaviour of female *Caretta caretta* (Nagorzanski & Pifeas 2013). The females are often interrupted while trying to find an adequate spot to nest or can't find any spot at all and crawl back to the sea without laying eggs. (Nagorzanski & Pifeas 2013).

Since more than two decades, the University of Vienna has been participating in a conservation program of several Turkish universities, and this year provided volunteer support for the Pamukkale University efforts to protect the *Caretta caretta* population and its associated nesting sites in Fethiye. The program includes monitoring, protection and information work and is giving some indication on changes.

## MATERIAL AND METHODS

From 2 July to 17 September 2016, Austrian students from the University of Vienna worked together with Turkish students from Pamukkale University to protect the vulnerable species *Caretta caretta*. The field course took place in Fethiye, which is divided into three sections, the beaches of Çaliş, Yanıklar and Akgöl. Çaliş beach is 2.5 km long and the substrate varies from fine sand to smaller and bigger stones. Half of the beach is bordered by a promenade wall, and restaurants, camps, sports facilities and hotels line most of the remaining part of the beach as well. The monitoring work included daily night and morning shifts, usually involving 3 persons patrolling the beach. Especially the promenade of Çaliş is highly frequented by tourists. Accordingly, we ran an information booth to provide information about *Caretta caretta* to tourists and local residents.

### Nightshifts

The nightshifts started at 10 pm and usually lasted 4 hours. In most cases the nightshift was divided into two parts: the first shift started at 10 pm and was relieved by the second one at 12 pm; the second then finished at 2 am. Three students walked in a transverse line along the beach: one student near the promenade, another one in the middle of the beach and the third along the waterline, so that the whole beach was covered. The shift started at the Fethiye-facing end of

the promenade, in front of the bar “Türkü Cadiri” and ended at the “Surf Café” (Fig. 4), where the team took a break of 15 to 20 minutes. Then the students returned to the starting point, where the other team was waiting to take over the second shift. Thus, altogether, the beach was patrolled 4 times per night. Toward the end of the nesting season, the team controlled only the remaining nests and did not walk shifts along the whole beach.

Each team was provided with the following equipment during the nightshift: a wooden calliper, a short and a long measuring tape, a red-light flashlight, a thermometer, a metal rod to probe the sand, walkie-talkies and a field data book. During the hatchling season also a bucket was necessary to carry the hatchlings to the sea.

If an adult loggerhead was encountered during the shift, the students sat or laid down at a distance of several meters behind to the turtle and remained quiet in order not to disturb the animal while trying to nest. It was also important to check the surroundings in order to intervene rapidly if people took photos or came too close to the turtle. The team waited until the loggerhead started crawling back to the water and then started the measurements. In order to speed up the process the specific work steps were split up beforehand; one student knelt down on the left side of the turtle, between the front and the back flipper, held the front side of the carapace with one hand and leaned on the back side with the other hand. Another student measured the straight carapace length and width (SCL and SCW) with the wooden calliper and the curved carapace lengths and width (CCL and CCW) with the short measuring tape. In the meantime, another student checked the flippers for tags. If no tags were found, the animal was marked with a metal tag on the right front flipper. The turtle was also checked for epibionts, injuries and deformations on the carapace, and one team member wrote down all the data in the field book. After the turtle was released to the sea, the team searched for the exact position of the nest with a metal rod (so-called shish), which was carefully stuck into the sand. Because the sand above the egg chamber is very loose, the shish penetrates the sand much more easily than in the surrounding area. When the nest was found, it was covered with a metal cage in order to protect it and to retain hatchlings during the night, later in the season. Because cages are sometimes displaced by other people, a triangulation was made additionally to determine the exact position of each nest (Fig. 1). This involved determining the distances between the nest and three landmarks, which were labelled with a permanent marker to relocate them again. A 30 m or 50 m measuring tape was used for this task. Furthermore the distance of the nest to the sea was measured and we distinguished the wet, moist and dry zone of the sand.

When a sea turtle crawls on land, it typically leaves a track behind (Fig. 7). In the case of visible tracks, the total lengths were measured, along with the width of the track. Also, a sketch of the track was drawn including body pits. If there was no nest laid by the sea turtle, the highest point of the track was recorded instead of the distance of the nest to the sea. After all the data were noted, the track was wiped away in order not to collect the same data twice.

### Morning shift

The morning shift started at 6 am and lasted about two hours. The beach was patrolled in the same way as during the nightshifts, with the difference that the team walked only once to the very end of the beach, known as “Çalış Tepe”. It was not necessary to take the wooden calliper along, because sea turtles nest only during the night. The tasks of the morning shift were to collect all data on tracks and nests that were made after the last night shift was finished. We also re-triangulated all known nests again to check if the cages had been moved away by other people.

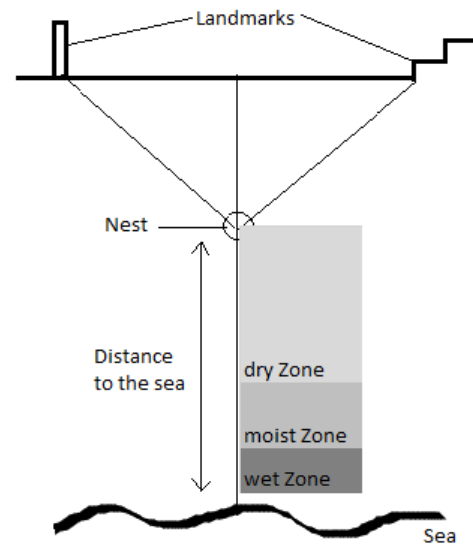


Fig. 1: Schematic illustration of a triangulation  
Abb. 1: Schematische Darstellung einer Triangulation

## RESULTS

### Nests

In the 2016 nesting season, 19 nests were recorded on Çalış beach. This number is much lower than the number of nests in 2015 (32 nests), 2013 (35 nests) and only half of the nests recorded in 2014 (Fig. 2). Nonetheless, the number of nests found this year was only somewhat under the average of the last 21 years (22 nests). Figure 2 shows a strong fluctuation in the number of nests over the last 21 years with peaks (more than 30 nests) in the years 1994, 2013, 2014 and 2015. The years 2003, 2005 and 2012 show the lowest numbers, with 11 nests in 2003 and 2005 and only 10 nests in 2012 (Fig. 2). Overall, the trend line shows a very slight positive trend since 1994, but this is no doubt heavily influenced by the high values in 2013-2015.

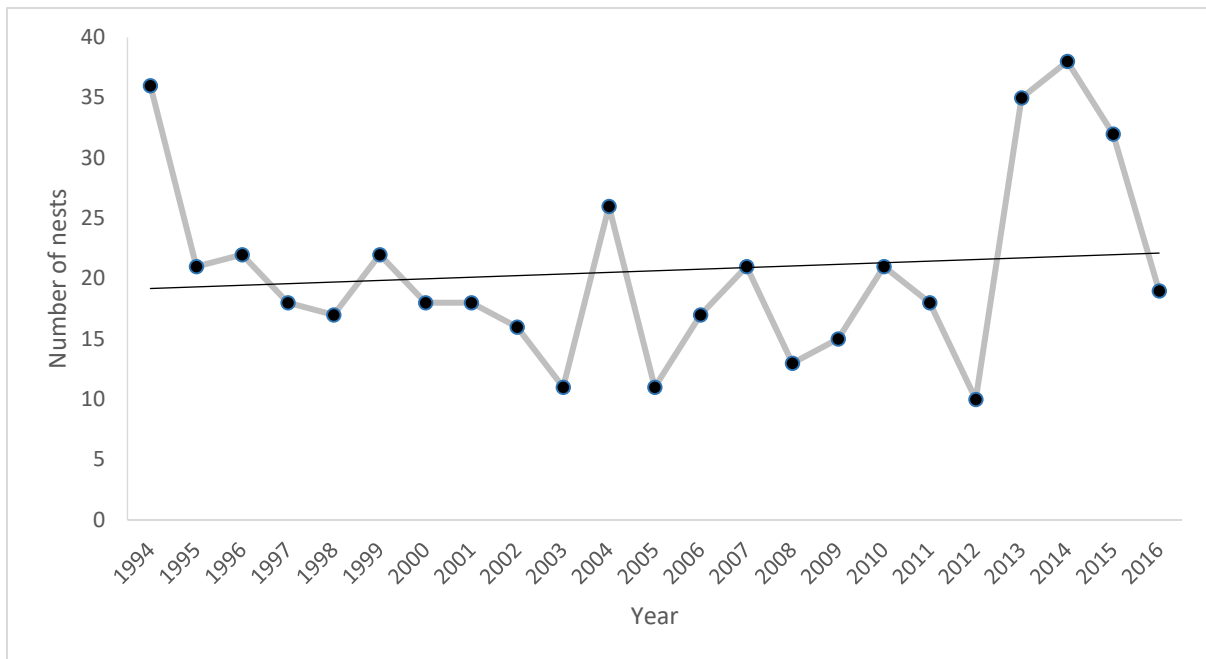


Fig. 2: Number of nests at Çaliş beach from 1994 to 2016  
 Abb. 2: Anzahl der Nester in Çaliş von 1994 bis 2016

The nests C8 to C11 and C13 (i.e. 5 nests) were found in attendance of Austrian students by observation of egg deposition during the night shift (C10, C11) or by finding the tracks in the following morning shift. Nests designated with an (S) are so-called secret nests. Several of these nests were detected only when the first hatchlings emerged, which means that the nesting date is not entirely clear (Tab.1). The nests C(S)1 to C(S)7 were found by Turkish colleagues based on the observation of tracks between May and June. The dates of egg deposition could not be determined exactly. The nests C(S)12 and C(S)14 to C(S)19 were also laid before the Austrian students arrived in Turkey and were not directly observed by Turkish colleagues when they were laid. All of these nests except C(S)17 were not discovered until hatching started, and thus the date of oviposition could only be estimated. Nest C(S)17 was found after a predation event and was excavated immediately.

No hatchery was necessary this year because the location of the nests did not require a relocation.

Tab. 1: Overview of nests on Çaliş beach with all collected data. ((S): secret nests, ~: approximate date of egg deposition, <: Nest laid before the date, - : no data available)

Tab. 1: Darstellung der Nester in Çaliş mit allen erhobenen Daten. ((S): secret nests, ~: ungefähres Datum der Eiablage, <: Nester wurden vor dem Datum gelegt, - : keine Daten vorhanden)

Nest	Location	Date of oviposition	Distance to sea (m)	Dry zone (m)	Moist zone (m)	Wet zone (m)	Total track length	Track width
C(S)1	Günes Hotel	-23.05.2016	16	14	1	1	-	-
C(S)2	Caretta Club	-09.05.2016	29.3	27	1	1.3	-	-
C(S)3	Secil Market	-04.06.2016	16.6	14	1	1.6	-	-
C(S)4	Çaliş Taxi	-17.06.2016	15.65	3.65	8.35	3.65	-	-
C(S)5	Casa di Mama	-23.06.2016	14	6	5	3	-	0.65
C(S)6	Eyna Hotel	-28.06.2016	17.26	7.76	6	3.5	-	0.57
C(S)7	1905 Pub	-28.06.2016	8.6	1.6	5.5	1.5	-	0.59
C8	Keyif Kafe	01.07.2016	9.5	6	2.5	1	-	0.52
C9	Light House	03.07.2016	13.2	9.2	2	2	31.4	0.63
C10	The Beatles travel	05.07.2016	12	8.5	1.5	2	24.9	0.58
C11	Hotel Serkul	09.07.2016	8.5	4.6	2.8	1.1	21.5	0.66
C(S)12	Serkul 1	<03.06.2016	10.8	5.5	2.3	3	-	-
C13	Picknic Area	18.07.2016	11.42	5.02	2.5	3.9	32	0.5
C(S)14	koca Çaliş	<15.06.2016	22.2	18.3	1.9	2	-	-
C(S)15	Daphne Resort	<16.06.2016	19.9	10.3	1.4	1.2	-	-
C(S)16	Merkan Restaurant	<25.06.2016	13.3	10.1	1.8	1.1	-	-
C(S)17	-	<30.06.2016	16.2	13.5	1.8	0.9	-	-
C(S)18	Letoon Hotel	<01.07.2016	24.9	19.8	2.8	2.3	-	-
C(S)19	Last Stop	<06.07.2016	17.45	11.65	1.5	4.3	-	-

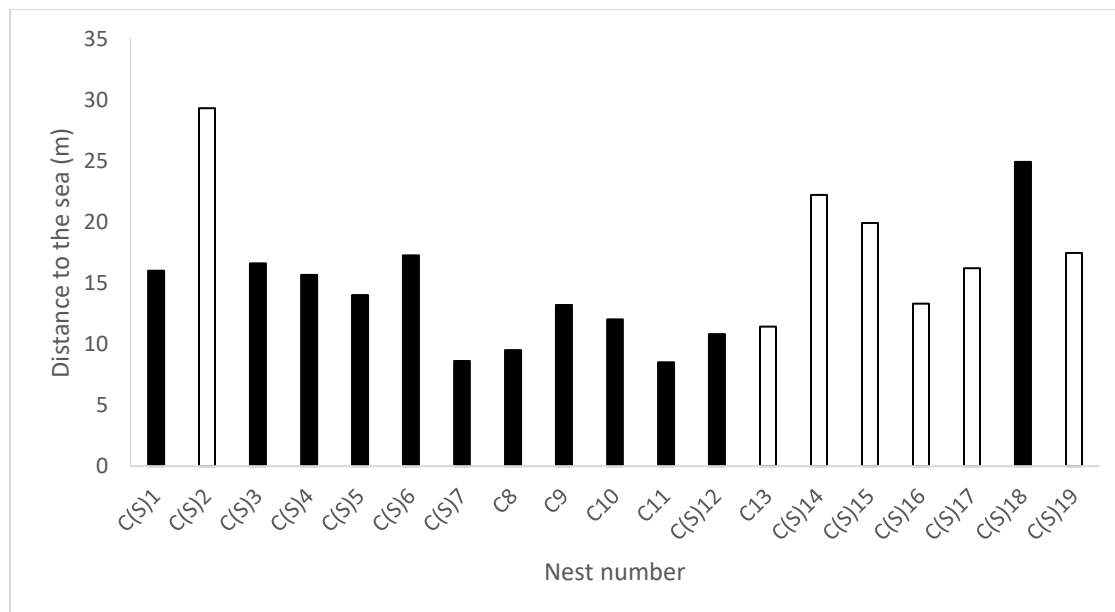


Fig. 3: Distance to the sea (m) of all nests laid in Çaliş. Black bars: nests in front of the promenade; white bars: nests offside

Abb. 3: Darstellung der Distanz zum Meer aller Nester in Çaliş. Schwarze Balken: Nester vor der Promenade; weiße Balken: Nester abseits

Twelve nests were laid in front of the promenade from “La casa di mama” to “Letoon hotel” (Fig. 4). Seven nests were located offside the promenade between the last stop of the dolmus bus and “Çalış Tepe”.

Figure 3 shows the difference in the distance to the sea between nests laid in front of the promenade and those laid offside the promenade. The average distance to the sea of nests in front of the promenade was 13.9 m, whereas the mean distance of nests offside the promenade was 18.5 m. Accordingly, nests offside the promenade had a 16 % longer distance to the sea.

Place for map

Fig. 4: Locations of nests on Çalış beach  
Abb. 4: Lage der Nester am Strand von Çalış



## Tracks

In the 2016 nesting season, a total of 28 tracks were documented on Çaliş beach. Nineteen of them led to a successful deposition of eggs, which is equivalent to a nesting success of 68% (Fig. 5). The remaining 9 nesting efforts were not successful, i.e. we found only tracks without any nests. Nests C10 and C11 were laid in the presence of the sea turtle team, whereas all the other nests were found based on tracks during the next morning shift.

The track width was documented for sixteen nests and averaged 59 cm (Tab. 1). The total track length was measured for thirteen nests, with an average length of 36.3 m.

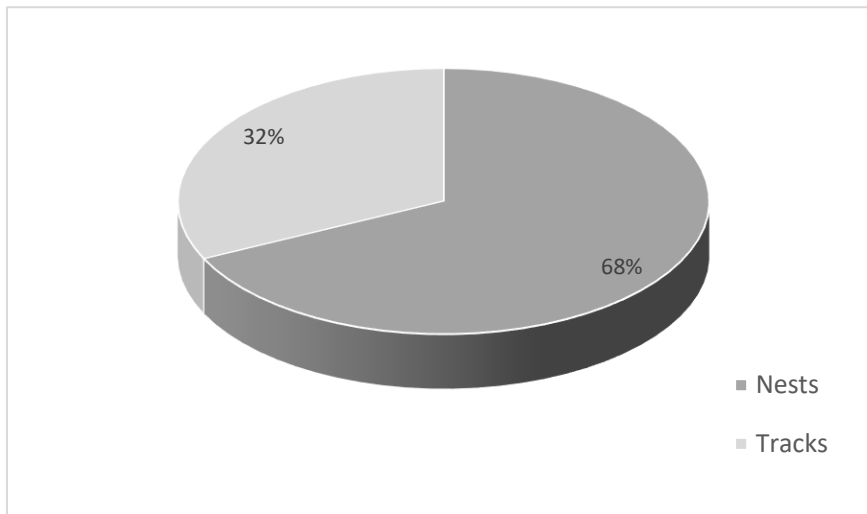


Fig. 5: Number of nests versus number of tracks without nests in percent. Light grey: tracks without nests, dark grey: nests

Abb. 5: Anzahl an Nestern verglichen mit der Anzahl an Spuren ohne Nester in Prozent. Hellgrau: Spuren ohne Nester, Dunkelgrau: Nester

## Adults

During this nesting season, only two female *Caretta caretta* were sighted on Çaliş beach by the sea turtle team (Tab. 2). Both turtles were newly tagged by Turkish students because they had no tags from earlier years. The tagging was done on the right front flipper.

Tab. 2: Data of the two female *Caretta caretta* observed in Çaliş

Tab. 2: Daten der beiden weiblichen *Caretta caretta* die in Çaliş beobachtet wurden

Nest	Date	Tag Nr.	SCL (cm)	SCW (cm)	CCL (cm)	CCW (cm)
C10	05.07.2016	TRA0339 R	0.67	0.55	0.75	0.68
C11	09.07.2016	TRY0340 R	0.71	0.55	0.76	0.69

## DISCUSSION

The number of nests in the nesting season of 2016 – 19 nests – is much lower than the recorded nests over the last 3 years. Considered over the last 22 years, the number of nests in this season is 3 fewer than the average of 22. In comparison with the years 2003 (11 nests), 2005 (11 nests) und 2012 (10 nest), however, the number is nearly twice as high. Generally, the number of nests fluctuated strongly over the last 22 years (Fig. 2). One potential explanation for this is that female sea turtles return at an interval of 2-3 years on land for nesting (Spotila, 2004). The trend line in figure 2 shows a very slight increase, but this result probably reflects the strong years 2013-2015. That high number of nests in 2013, 2014 and 2015, however, could be interpreted as a success of the sea turtle conservation program. Accordingly, those hatchlings helped to the sea in greater numbers in the 1990s are now returning as adults. A Mediterranean loggerhead turtle reaches sexual maturity after 16 to 28 years (Casale et al. 2009). This and the fact that female sea turtles return to the beach on which they hatched to lay their nests, known as “natal homing” (Bowen et al. 2004), would support this positive interpretation.

The nests on Çaliş beach are not regularly distributed. Twelve nests are located in front of the promenade and seven offside the promenade (Fig. 3), which means that 63% of all nests are laid in the area along the promenade. The highest density of nests occurred between “La casa di mama” and “Keyif Kafe” (Fig. 4) – eleven of the twelve nests in front of the promenade are located in this part. The lowest nesting activity occurred in the section between “Surf Café” and “Çaliş Tepe” (Fig. 4). It is interesting that the female loggerheads apparently preferred this part of the beach with numerous people, sunbeds, much noise and lights. One reason for this could be the fine sand in this area. Generally the sand along the promenade is more suitable for nesting than offside the promenade, where larger stones and hard underground complicate digging an egg chamber. Therefore, although nesting turtles are less disturbed by people and light offside the promenade, they prefer the area in front of the promenade (it should be noted, however, that the almost uninterrupted series of establishments along the beach offside the promenade also poses a considerable disturbance to sea turtles). Nonetheless, the assumption is that sand quality is one of the most important variables for a successful egg deposition. Therefore it is very important to protect the area along the promenade from disturbance caused by humans. A regulation for entering the beach after 10 pm would be one solution, and based on the signs this regulation is in fact in force. But enforcement appears to be unrealistic in view of the situation along the promenade. However, it would be very important to set up more effective and uniform signs along the beach giving information about sea turtles and construction about how people should act on the beach (also with explanations by icons) (Fig. 8). Also the owners of hotels,

restaurants and bars should be better informed about *Caretta caretta* and should share their knowledge with their guests. A study from 2011 showed that 38% of the people did not know that Çaliş beach is a nesting area of *Caretta caretta* (Rössler 2011). That is why the propagation of information is very important and should not only be done by the information booth of the sea turtle team.

It is also necessary to put away all the sunbeds during the night because they represent obstacles for sea turtles coming on land (Fig. 6). Also the establishment of sufficient rubbish bins along the beach and a reduction of light pollution is hugely important. In comparison with the beach of Dalyan, which is also a Special Protected Area, Çaliş beach is in a very poor condition from the perspective of conservation. Generally, most nesting sites in the Mediterranean Sea are under pressure from tourist development (Margaritoulis et al. 2003).

As figure 3 also shows, nests in front of the promenade are on average 4.6 m closer to the sea than those offside the promenade. That is because the beach area along the promenade is much narrower than the rest of Çaliş beach, which suggests that sea turtles try to place their nests far away from the sea. The farther the nests are distant to the sea, the lesser is the risk of getting flooded, which leads to a higher risk in egg mortality. But this is only valid for moisture: a too large distance to the sea can lead to other problems e.g. with plant roots.

Interestingly, both observed female turtles laid their nest during the second night shift, i.e. after 12 pm. Also, all of the other documented nests and tracks were found during the next morning shift, which means that female turtles came on land after 2 am. One reason for this could be the decreasing anthropogenic disturbance after midnight. For example, we observed that the activity of visitors on the promenade and on the beach decreased after 12 pm and became very low at 2 am. Also, more and more lights were turned off, reducing the light pollution.

For following nesting seasons it would be interesting to also record the locations of tracks without nests. This would enable a comparison between the nesting attempts and the total track lengths in front and offside the promenade.

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## APPENDIX



Fig. 6: Sun beds and parasols on Çaliş beach along the promenade. Note unobstructed nesting zone (photo: T. Polleres)

Abb. 1: Sonnenliegen und –schirme auf dem Strand von Çaliş entlang der Promenade



Fig. 7: Track of an adult *Caretta caretta* (photo: D. Lambropoulos)  
Abb. 7: Spur einer adulten *Caretta caretta*



Fig. 8: Small information sign at an entrance from promenade to Çaliş beach (photo: M. Jehle)  
Abb. 8: Informationstafel an einem Eingang von der Promenade zum Strand von Çaliş