LOGGERHEAD TURTLE HATCHLINGS IN ÇALIŞ 2016

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ABSTRACT

Çaliş Beach is not only a tourist attraction, but also one of the Special Protected Areas (SPA) for *Caretta caretta* and *Chelonia mydas*. To protect the turtles on this touristic beach, the University of Vienna has worked since 1994 together with different Turkish Universities. In the turtle nesting season 2016, Pamukkale University hosted 11 Austrian students from early July until mid-September. A total of 19 nests were recorded on Çaliş Beach; 14 of these were so-called secret nests, i.e. they were found only after the first hatchlings emerged. A total of 1665 eggs were counted, of which 1518 (95%) were fertilized and 79 (5%) unfertilized eggs. Of the fertilized eggs, 17% died in the early embryonic stage, 2 % in the mid embryonic stage and 10% in the late embryonic stage. The average number of eggs per nest was 87 (SD ±27). The success rate (percentage of hatchlings reaching the sea/total number of eggs) was 57.8%. A maximum of 963 hatchlings reached the sea in Çaliş in 2016. The number of hatchlings is less than in the last three years and similar to the beginning of the sea turtle project in 1994.

KURZFASSUNG

Der Çaliş Strand ist nicht nur eine touristische Attraktion, sondern auch eine ‚special protected area' (SPA) für *Caretta caretta* und *Chelonia mydas*. Um die Schildkröten an diesem touristischen Strand zu schützen, arbeitet die Universität von Wien mit verschiedenen türkischen Universitäten zusammen. In der Schildkrötensaison 2016 haben 11 österreichische Studenten auf Einladung der Pamukkale Universität an diesem Projekt von Anfang Juli bis Mitte September zusammen gearbeitet. Es wurden 19 Nester am Strand von Çaliş gefunden, wovon 14 sogenannte ‚secret nester' sind: sie wurden erst entdeckt, nachdem die erste Hatchlinge geschlüpft sind. Insgesamt wurden 1665 Eier gezählt, wovon 1518 (95%) befruchtet und 79 (5%) nicht befruchtet waren. Von den befruchteten Eiern sind 17 % in frühen, 2 % im mittleren und 10 % im späten embryonalen Stadium gestorben. Die durchschnittliche Anzahl an Eiern pro Nest war 87 (SD ±27). Die Erfolgsrate (Prozentsatz von Hatchlingen, die ins Meer gelangen/ Anzahl an Eiern) war 57.8%. Es erreichten 963 Hatchlinge 2016 am Strand in Çaliş das Meer. Die Anzahl an Hatchlingen ist geringer als in den letzten drei Jahren und vergleichbar zu den Anfängen vom Meeresschildkrötenprojekt in 1994.

INTRODUCTION

In the world oceans there are 7 different sea turtle species: Leatherback Turtle (*Dermochelys coriacea*, Vandelli 1761), Kemp´s Ridley Turtle (*Lepidochelys kempii*, Garman 1880), Olive Ridley Turtle (*Lepidochelys olivacea*, Eschscholtz 1829), Hawksbill Turtle (*Eretmochelys imbricata*, Linnaeus 1766), Flatback Turtle (*Natator depressus*, Garman 1880), Green Turtle (*Chelonia mydas*, Linnaeus 1758) and Loggerhead turtle (*Caretta caretta*, Linnaeus 1758).

The Loggerhead turtle is the most common species in the Mediterranean Sea, with main nesting areas in Greece, Turkey and Cyprus, as well as Libya, Syria, Israel and Egypt. There are 14 important nesting beaches for *Caretta caretta* in Turkey. Three of these beaches have been declared Specially Protected Areas (SPAs) by the Barcelona Convention: Dalyan, Patara and Fethiye. This, however, cannot change the fact that Çaliş Beach still has growing tourism: the light pollution from the restaurants and hotels, but also the watersports and the high number of tourists and local residents on the beach at all hours pose a threat for the turtles. Since 1994 the University of Vienna together with different Turkish universities have focused their sea turtle conservation work on the Fethiye beaches – Akgöl, Yaniklar and Çaliş. Of the total 3.5-km-long Çaliş Beach, about 2.5 km are a nesting area.

A female turtle lays nests in an interval of 2 to 4 years. During one season an average number of 3.9 nests can be laid, each of which can have up to 112 eggs (Spotila 2004). The incubation time takes between 45 to 80 days; it depends on external factors such as sand temperature, nest location, humidity and depth of the egg chamber. With the help of their ‘egg tooth’ the *Caretta caretta* hatchlings can open their eggs and then crawl to the surface. Usually they come out after sunset to make their way to the sea. Once they reach the sea, they swim for six to seven days without long breaks (Spotila 2004).

The emerging hatchlings orientate by visual cues, responding to a 30° vertical and 180° horizontal range above the horizon. The hatchlings are drawn seawards under natural conditions by the reflected light of the moon and the stars on the water and by the downward slope of the beach (Spotila 2004). In case of the Çaliş Beach, however, most of the light comes from the restaurants and hotels in the back: the hatchlings become disorientated and crawl inland, where they die from the heat, exhaustion or are run over by vehicles or eaten by predators (Witherington & Martin 2000).

MATERIAL AND METHODS

In summer 2016, between the beginning of July until mid-September, each student from the University of Vienna spent 5 weeks in Turkey in the framework of a sea turtle conservation course. At the invitation of and together with professors, students and volunteers from Pamukkale University, they engaged in protecting sea turtles. All the participants were based in a camp in Çaliş.

The work consisted of 5 basic tasks: morning shifts in Yaniklar and Çaliş, night shifts in Yaniklar and Çaliş, information desk service. The excavations of the nests were done during the morning shift or in the late afternoons. At every shift there was at least one Austrian and one Turkish colleague present. The night shift was divided into 2 parts, the first shift was from 10 p.m. to 12 p.m. and the second one from 12 p.m. to 2 a.m. From the starting point in Çaliş, the "Turkish Cadiri Restaurant", to the "Surf Café" and back, the beach patrol took about 2 hours. In early July the main task, while patrolling the beach, was to look out for female loggerhead turtles. They move onto the beach to lay their eggs there. We also kept our eyes open for adult turtle tracks as well as for hatchling tracks and hatchlings inside and outside the nest protection cage. In early August no more adult turtles emerged onto the beach, so the night shift focused on patrolling only the remaining nests to look for hatchlings. The night shift in Yaniklar stopped already in the second week of July after the first hatchings emerged to the risk of stepping on them in the darkness would have been too high. The morning shift in Çaliş started at 6 a.m. at the same starting point, but also included Çalişsteppe at the other end of the beach. The main goals of the patrolling were to look for new tracks of adults and hatchlings, to check if the cages were still on the right spot and to check the nests for new hatchlings. The morning shift in Yaniklar, which also included Akgöl beach, also started at 6 a.m.

The female *Caretta caretta* that came out on the beach were measured and tagged. If the turtle laid a nest, a cage was put on the nest and the nest coordinates were taken. It was also important to triangulate the nest, so if the cage became displaced, it was possible to put it back at the right spot. The cages were metal and pyramid-shaped with a sign on the top (in Turkish, English, German and Russian) informing tourists about the reason for this cage so they wouldn´t move it. It was also possible to find the nests with the help of adult tracks. When turtles complete their nest, they "camouflage" it to confuse potential predators and scavengers. With some training, these sites can be distinguished and a thin metal rod can be used to carefully find the egg chamber (the sand is looser there). Another way to find a nest was with the help of the hatchling tracks, such nests are designated as "secret nests". Under ideal conditions, the beginnings of such tracks indicate the position of the egg chamber. Under conditions of light

pollution, however, the misoriented and disoriented hatchlings leave no useful clue as to the egg chamber location.

Later in the nesting season, the main task when patrolling was to make sure that the hatchlings would reach the sea. Çaliş is a touristic beach with many hotels, restaurants and bars, which have bright lights until the morning hours. Hatchling orientation is based on the brightest spot, which would be the horizon above the sea under natural conditions. In Çaliş, however, the brightest area is in the back of the beach. Many emerging hatchlings therefore run in the wrong direction, making it necessary to collect them. The 'Caretta-Team' always carried boxes during the shifts. Hatchlings captured at night were collected and then brought to a dark place for release. They were watched until they made their way to the ocean.

A few days after the last hatchlings emerged, we checked the nest for any barriers such as stones, which can hinder the hatchlings from coming out.

If no barriers were found and no more hatchling was emerging, the nests were excavated. Either in the morning or in the late afternoon, the nests were opened. We measured the egg chambers and counted the egg shells, closed eggs, dead turtles or living hatchlings. The empty egg shells were used to calculate the number of hatchlings that had emerged. The closed eggs were variously categorized: unfertilized eggs and fertilized eggs. Three different embryonic stadiums were determined for the fertilized eggs: early (no pigmentation), middle (size > 1 cm and pigmented eyes) and late (full pigmentation and size > 2 cm).

RESULTS

In the 2016 nesting season there were 19 nests of *Caretta caretta* on Çaliş Beach. Fourteen nests out of the 19 were secret nests, i.e. they were found only based on the first hatch. A maximal number of 963 hatchlings reached the sea in Çaliş in 2016.

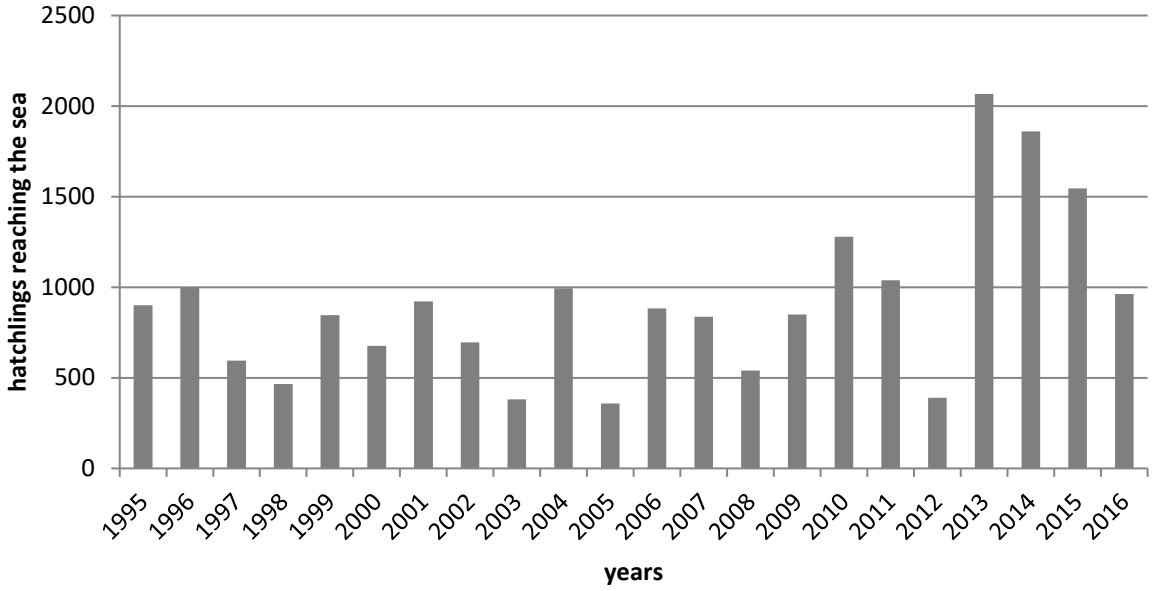

Fig. 1: Number of hatchlings reaching the sea in Çaliş from 1995 until 2016.
Abb. 1: Anzahl an Hatchlingen, die in Çaliş zwischen 1995 und 2016 das Meer erreicht haben.

The comparison between hatchlings reaching the sea in 2016 and the remaining years since 1995 is shown in Figure 1. This year was the lowest of the last four years (2013, 2014, 2015), where there were more than 1500 hatchlings, but significantly higher than in 2012. Also, the success rate of 57.8% was lower than in the last three years (Figure 2). The average success since 1995 is 61% (SD ±9.9), which means that this year's value is close to the average.

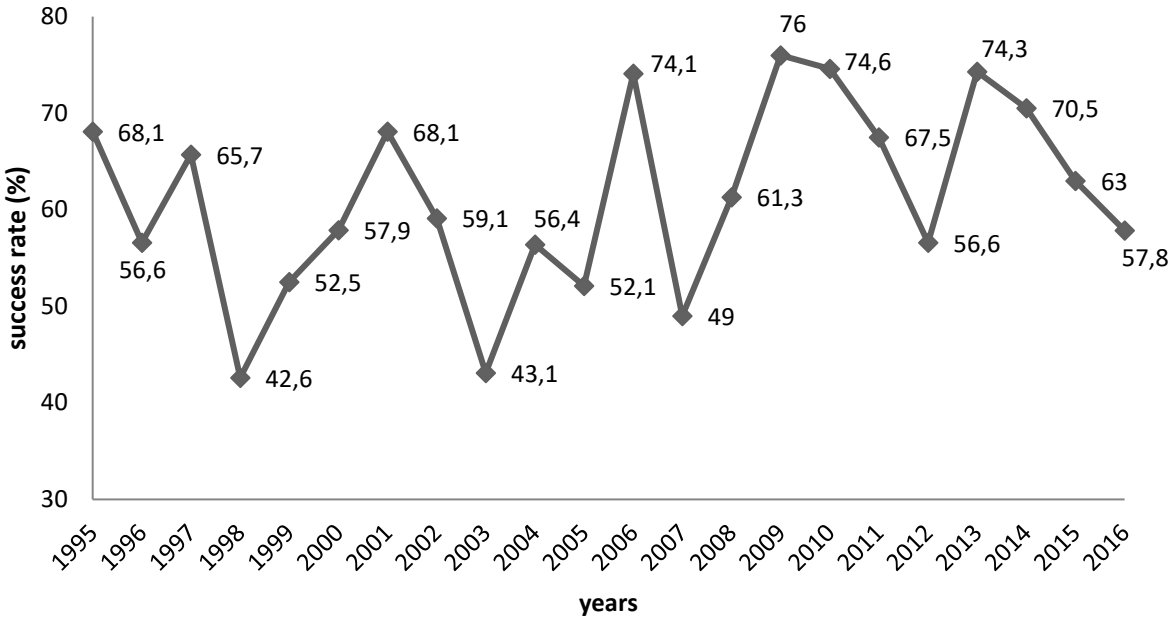

Fig. 2: Success rate (%) from 1995 until 2016.
Abb. 2: Erfolgsrate (Prozent an Hatchlingen, die das Meer erreichten, zu der Anzahl an Eiern im Nest) in den Jahre 1995 bis 2016.

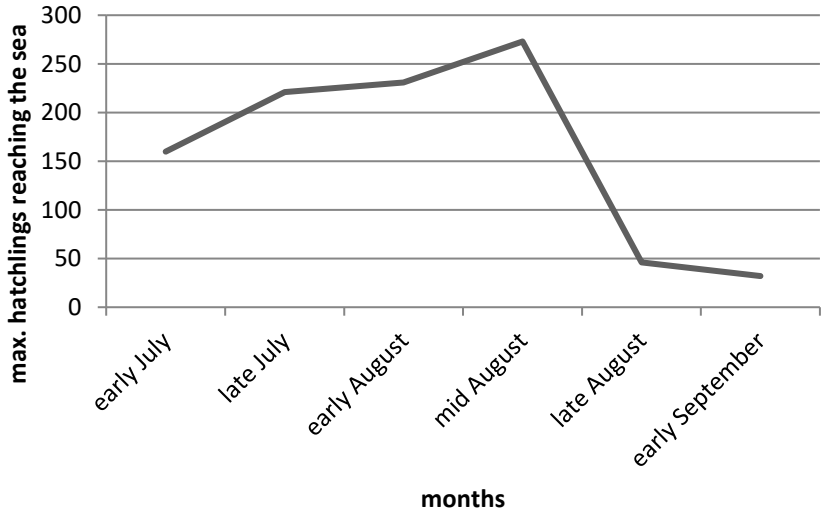

Fig. 3: Number of hatchlings during the nesting season 2016 in Çaliş. Early July (1.-15.), late July (16.-31.), early August (1.-10.), mid-August (11.-19.), late August (20.-31.), early September (1.-10.).
Abb. 3: Anzahl der Schlupfereignisse während der Nistsaison 2016 in Çaliş.

Nest number C2 was the first nest to hatch in the 2016 season (on 10 July), and the last nest with hatchlings was C13 on 5 September. Figure 3 shows the hatchling numbers over the season 2016. The hatchlings reaching the sea increased from early July on and peaked in mid-August. It then dropped rapidly in the late August and early September.

Tab 1: Overview of all the nest data for the 2016 nesting period in Çaliş: nest date (unknown: 'secret nest'), date of first hatch, incubation time (unknown: 'secret nest'), number of eggs, number of fertilized eggs, number of unfertilized eggs, number of dead hatchlings stuck in egg, number of hatchlings died in early-, mid- and late-embryonic stage, number of empty shells, number of predated/dead hatchlings, success rate (ratio between number of eggs and maximal hatchlings reaching the sea).

Tab1: Überblick über alle Nestdaten der Nistsaison 2016 in Çaliş.

Nest	Nest date	Date of first hatch	Incubation time [days]	Distance to the sea [m]	Number of eggs	Fertilized eggs	Unfertilized eggs	Hatchlings stuck in egg	Early-embryonic stage	Mid-embryonic stage	Late-embryonic stage	Empty shells	Number of predated/ dead hatchlings	Maximal hatchlings reaching the	Success rate [%]
C(S)1	*unknown*	x	*unknown*	16	90	88	2	0	27	0	0	61		61	67,8
C(S)2	*unknown*	10.07.16	*unknown*	29	161	128	6	3	9	0	3	113	27	76	47,2
C(S)3	*unknown*	27.07.16	*unknown*	17	75	73	2	0	9	0	1	63		63	84,0
C(S)4	*unknown*	03.08.16	*unknown*	16	94	78	16	0	6	1	4	67	1	66	70,2
C(S)5	*unknown*	06.08.16	*unknown*	14	69	67	2	1	15	0	16	35	3	32	46,4
C(S)6	*unknown*	10.08.16	*unknown*	17	77	77	0	6	49	2	1	19	1	18	23,4
C(S)7	*unknown*	13.08.16	*unknown*	9	88	63	6	0	9	0	16	38	21	17	19,3
C8	01.07.16	12.08.16	43	10	84	75	9	0	75	0	0	0		0	0,0
C9	03.07.16	17.08.16	46	13	93	93	0	0	8	3	4	78		78	83,9
C10	05.07.16	16.08.16	43	12	53	53	0	0	7	1	2	43		43	81,1
C11	09.07.16	20.08.16	43	9	52	52	0	0	5	0	1	46		46	88,5
C(S)12	*unknown*	13.07.16	*unknown*	11	109	107	0	0	6	0	15	86	16	84	77,1
C13	18.07.16	05.09.16	57	11	56	34	22	1	0	0	1	32		32	57,1
C(S)14	*unknown*	27.07.16	*unknown*	22	89	89	0	0	0	1	20	68		68	76,4
C(S)15	*unknown*	28.07.16	*unknown*	20	96	95	1	0	2	0	2	91	1	90	93,8
C(S)16	*unknown*	06.08.16	*unknown*	13	140	123	0	0	3	0	42	78	17	54	38,6
C(S)17	*unknown*	11.08.16	*unknown*	16	81	81	0	0	3	0	4	74	2	72	88,9
C(S)18	*unknown*	12.08.16	*unknown*	25	95	82	10	1	20	24	21	16	12	7	7,4
C(S)19	*unknown*	17.08.16	*unknown*	17	63	60	3	0	1	0	1	58	2	56	88,9
					1665	**1518**	**79**	**12**	**254**	**32**	**154**	**1066**	**103**	**963**	**60,0**
					Total										**Mean**

The average success rate, which is the percentage of the maximum of hatchlings reaching the sea in comparison to the total number of eggs in the nest, was 57.8% in the season 2016.

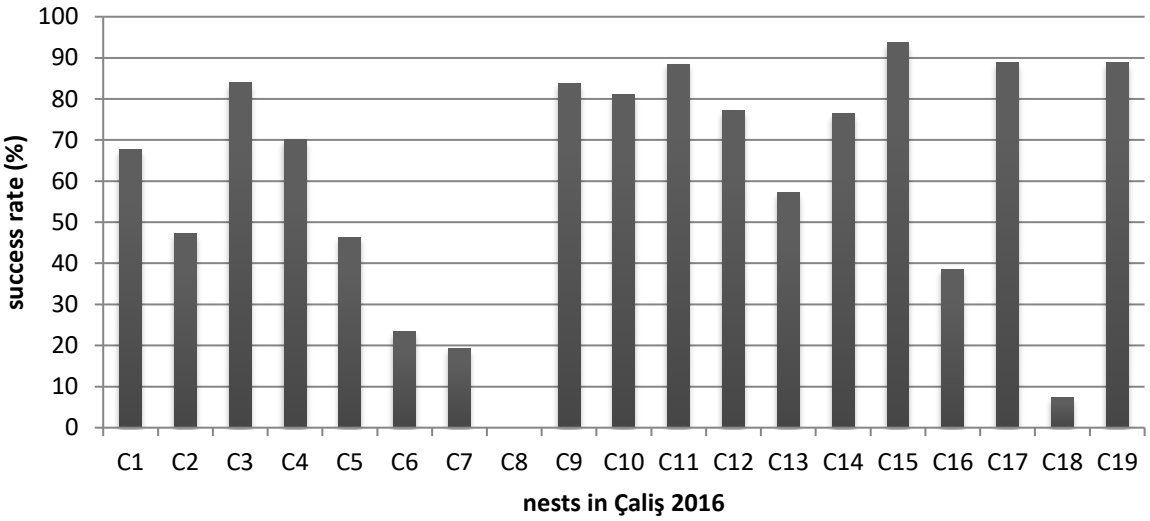

Fig. 4: The success rate (%) of the nests in Çaliş 2016.
Abb. 4: Die Erfolgsrate (%) von den Nestern in Çaliş 2016.

Figure 4 shows that 10 nests had a success rate higher than 70 %, another two nests were above 50%: There were also nests with very low success rates: C8 and C18 were under 10%.
Figure 5 shows the difference between the number of eggs and the hatchlings reaching the sea. The average number of hatchlings per nest is 88 (SD ±27) with a range of 52 to 161 eggs per nest.

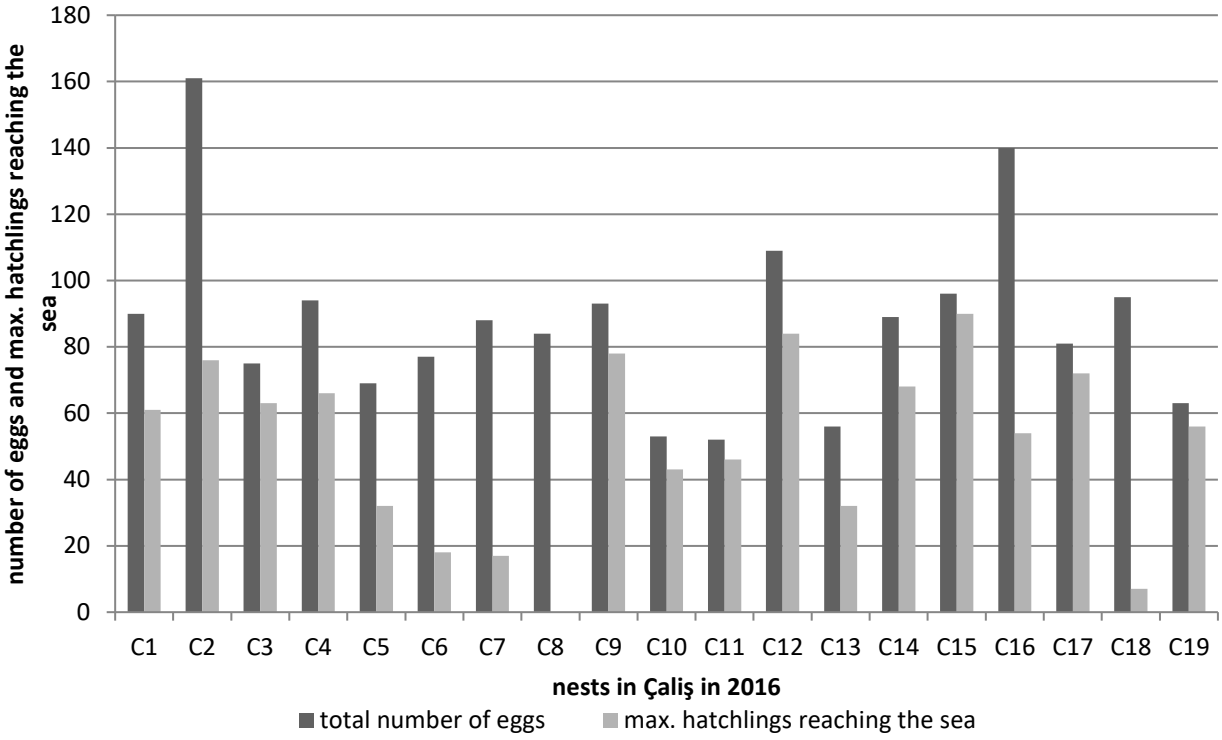

Fig. 5: Total number of eggs (dark grey) compared with the number of hatchlings reaching the sea (light grey) for each nest.
Abb. 5: Gesamtzahl der Eier pro Nest (dunkel grau) im Vergleich zu den Hatchlingen, die das Meer erreicht haben (hellgrau).

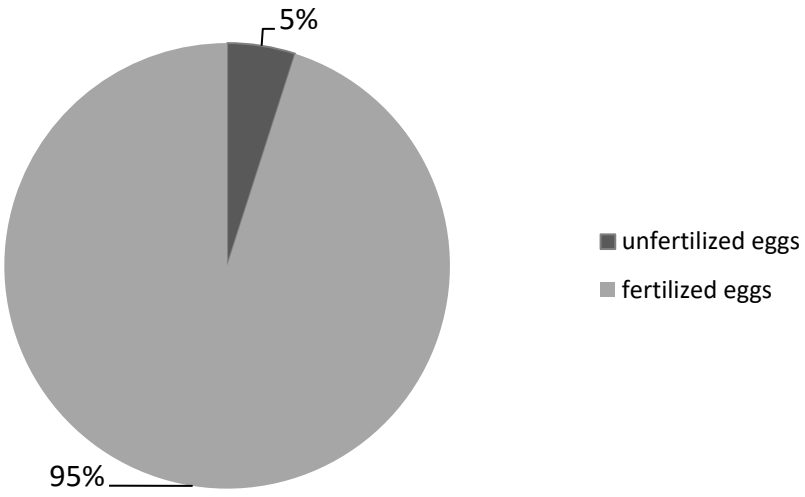

Fig. 6: Percentage of fertilized and unfertilized eggs laid in Çaliş in 2016.
Abb. 6: Prozentsatz von befruchteten und unbefruchteten Eiern, die 2016 in Çaliş gelegt wurden.

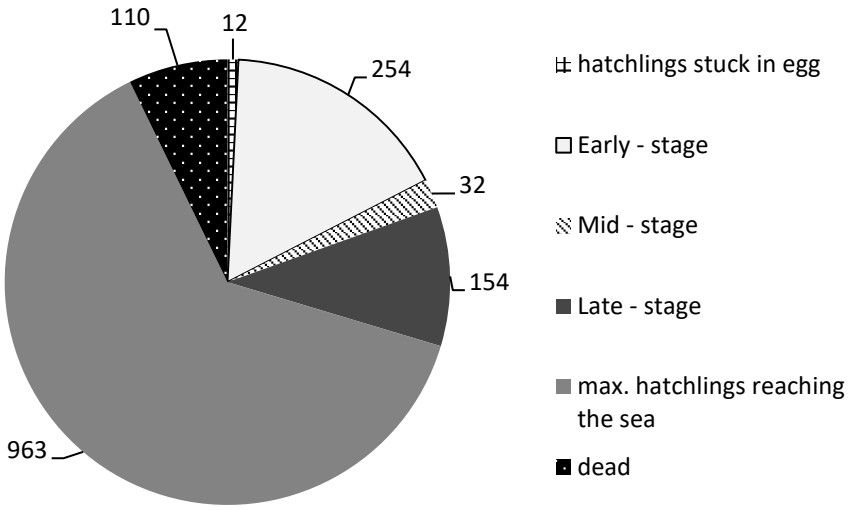

Fig. 7: Number of hatchlings stuck in the egg, early embryonic stage, mid embryonic stage, late embryonic stage, max. number of hatch reaching the sea, dead hatchlings.
Abb. 7:Anzahl an Hatchlingen, die im Ei stecken geblieben sind, Hatchlinge gestorben im frühen, mittleren und späten embryonalen Stadium, maximale Hatchlingsanzahl, die ins Meer gekommen ist und tote Hatchlinge.

A total of 1665 eggs was counted during the excavations, with 95% (1518) fertilized and 5% (79) unfertilized eggs. The highest number of unfertilized eggs was 22 in C13, which is high considering the total number of eggs (56). Of these fertilized eggs, 916 hatchlings reached the sea (this number was calculated by subtracting the dead hatchlings from the empty shells). The maximum number of hatchlings reaching the sea is a ´best case scenario´ because it assumes that all the emerged hatchlings made it to the sea if they were not found dead by us. 103 dead hatchlings were found either outside the nests (72), where they had died due to the sun's heat or predation, or found inside the nest during excavations (38). Twelve hatchlings were found stuck in the egg inside the nest. During excavations the closed eggs were examined and they contained 275 early-stage, 32 mid-stage and 154 late-stage embryos. Figure 8 shows the number of dead embryos found in the nests, which provides more information on potential problems during embryonic development. For example, C8 was flooded with water in the early embryonic stage.

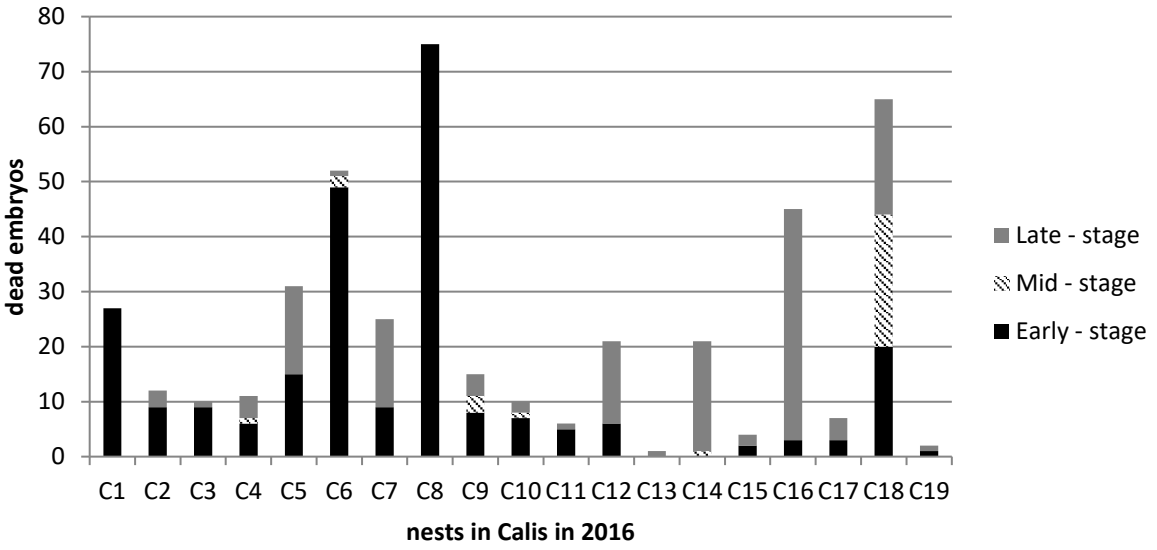

Fig. 8: Number of dead embryos in each nest – separated into early embryonic stage (black), mid embryonic stage (dashes), late embryonic stage (grey).
Abb. 8: Anzahl an toten Embryos in den Nestern – unterteilt in frühes embryonales Stadium (schwarz), mittleres embryonales Stadium (strichliert) und spätes embryonales Stadium (grau).

DISCUSSION

The IUCN Red List of Endangered Species puts the Mediterranean subpopulation of *Caretta caretta* in 2015 under the category 'Least Concern': 'A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.' (http://www.iucnredlist.org/details/83644804/0; 18.10.16). Is this assessment of the Loggerhead turtle also understandable in light of the data of the year 2016 at Çaliş Beach?

The hatching success rate (eggs in the nests versus hatchlings reaching the sea) is quite low, namely 57.8%, especially considering the years 2013 with a mean success rate of 74.3% or 2009 with 76%. But there were high success rates in a few of the nests. The most successful nest (93.8 %) was C15, where out of 96 eggs 90 hatchlings reached the sea and only one dead hatchling, two early and two late embryos were found. In contrast, the worst nest was C8: because of its short distance to the sea (10 m) it was under water in the beginning of the incubation. This explains why all the hatchlings died in the early embryonic stage. Also nest C18 had a low success rate (7.4 %): only a maximal seven hatchlings reached the sea. Of the 95 eggs, 65 died as embryos and 12 hatchlings were predated.

The number of nests and hatchlings in 2016 was lower than in the previous three years. The positive values of the last three years were not evident this season. The reproduction pattern of Loggerhead turtles means that they do not nest every season (Margaritoulis 2005). This could mean that this year simply represents a lull in nesting and that in the next years the nesting activity at the Çaliş Beach could increase again. But the decrease could also be because of environmental or anthropogenic factors. Unfortunately, other factors could also be at play. For example, the number of dead turtles in Fethiye during the 2016 nesting season (20) is the highest recorded since the beginning of the sea turtle monitoring program in Turkey (Seidler 2016). Many of them died because of direct and indirect human impacts, for example from boat propellers, water sports or because of entanglement or ingested plastic. This high number of dead adults could be one reason why fewer turtles came out to nest. The light pollution on the Çaliş Beach continues to be a problem: it misorients or disorients hatchlings on their way to the sea. If only an estimated 1 in 1000 hatchlings reaches sexual maturity and reproduces (Frazer 1983), and only 963 hatchlings reached the sea in Çaliş Beach, then the future looks less bright than the IUCN's recent listing indicates.

Accordingly, listing *Caretta caretta* as 'Least Concern' is misleading at best, a major misjudgement at worst.

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APPENDIX

Figure 10: Cage to protect nest in Akgöl. (Photo: M.Jehle)
Abbildung 9: Schutzkäfig für die Nester.

Figure 10: Hatchling on the way to the sea. (M.Jehle)
Abbildung 10:Ein Hatchling auf dem Weg zum Meer.

Figure 11: Excavation: eggs of C.caretta.
Abbildung 11:Eier einer C.caretta.

Figure 92: Excavation: empty egg-shells.
Abbildung 12: Leere Eischalen.

Figure 13:Hatchling tracks showing the location of the secret nest. (Photo: M. Jehle)
Abbildung 13:Hatchlingspuren, die den Ursprung eines „Secret nestes“ zeigen.

Figure 14: Two hatchlings trapped in a plastic bag at the beach. (Photo: M. Jehle)
Abbildung 14: Zwei Hatchlinge die sich in einem Plastiksack am Strand verlaufen haben.