

**MONITORING AND CONSERVATION OF SEA TURTLES
(*Caretta caretta*, *Chelonia mydas*) POPULATIONS WITHIN THE
SCOPE OF FETHIYE – GÖCEK SPECIALLY PROTECTED AREA
MONITORING SPECIES AND HABITAT PROJECT 2013**



Only one in a thousand may survive to full adulthood



Helping an injured turtle means looking after 1000 of hatchlings for 25-30 years

We would like to express our very great appreciation to various people for sharing their experiences and knowledge with us during implementation of “Monitoring and Conservation of Sea Turtles (*Caretta caretta*, *Chelonia mydas*) populations within the Scope of Fethiye – Göcek Specially Protected Area Monitoring Species and Habitat Project – 2013”;

Special thanks to Mr. **Osman İYİMAYA** General Director of The General Directorate of the Protection of Natural Assets – Ministry of Environment and Urbanization and Deputy General Director Mr. **Osman ÖZTÜRK**, Head of Area Management Department **Dr.Ali ÖZKIR**, Branch Director Mr. **Güner ERGÜN**, Branch Director Mrs. **Leyla AKDAĞ**, Aquaculture Engineer Mr. **Ahmet ERYİĞİT**, Environmental Engineer Mrs. **Damla BAYKAL**, Agriculture Engineer Mr. **Murat Karahan**, Mapping Engineer Mr. **İbrahim YALAVAÇ**, Biologist **Eyüp YÜKSEL** and Biologist **Emrah MANAP**,

We would also extend my thanks to Managers and officers of Provincial Directorate of Environment and Urbanization for their supports and contributions during field studies,

And once again, We would like to thank to our volunteers for their data collection, conservation and education efforts during the project.

Assoc. Prof. Dr. Eyup BAŞKALE
Project Manager

1. SEA TURTLES

There are 8 species of sea turtles are living in the world (Lutz & Musick, 1997) (Table 1 / Figure 1).

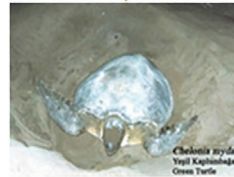
Table 1 : Sea turtle species of the world

Species	English Name
<i>Dermochelys coriacea</i>	Leatherback Turtle
<i>Chelonia mydas</i>	Green Turtle
<i>Chelonia agassizii</i>	Black Turtle
<i>Caretta caretta</i>	Loggerhead Turtle
<i>Eretmochelys imbricata</i>	Hawksbill Turtle
<i>Lepidochelys olivace</i>	Olive Ridley
<i>Lepidochelys kempii</i>	Kemp's Ridley
<i>Natator depressus</i>	Flatback Turtle



The breeding season starts in early May and extends to early October. The peak nesting occurs in June or July depending on a beach and species. The hatching season usually starts after the second week of July.

Nesting Species in Mediterranean



Non-nesting species in the Mediterranean



Species not recorded in the Mediterranean

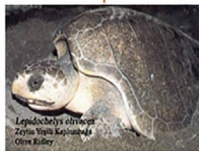


Figure 1: Sea turtle species

Some Interesting Characteristics of Sea Turtles

- 🐢 Sea turtles show natal homing instincts that bring them back to beaches where they were born to nest.
- 🐢 Females nest 3-5 times in every 2-3 years. Interval between each nest is about 15 days.
- 🐢 Loggerhead turtles build their nests at about 50-60 cm depth on the beach, green turtles at about 90-100 cm depth. Clutches of eggs are between 50-100 and each egg is about the size of a ping-pong ball. The incubation period is between 45-65 days.
- 🐢 Sexual maturity takes 25-30 years in sea turtles. Only 3-5 of every thousand hatchlings can survive until full maturity.
- 🐢 The sex of sea turtles is 'temperature dependent'; higher temperatures (32 °C) produce females and lower temperatures (26°C) males.
- 🐢 *C. caretta* is carnivorous and can dive up to 200 meters sea depth while *C. mydas* is herbivorous and can swim at a depth of 20-50 meters.
- 🐢 Sea turtles are 'ecotransformers'. They eat and live in water but move to the land and deposit their eggs.
- 🐢 Sea turtles don't have teeth, but they have very strong jaws and saw-shaped palate. They tear and crush food and thereby create small particles of food for other animals.
- 🐢 Some sea turtles feed on jellyfishes. They sometimes eat plastic bags instead of jellyfish by mistake, they can suffocate and die.
- 🐢 Newly hatched turtles orientate towards reflection of moon and reach to the sea, but they become disorientated when they see any light other than from the sea.

1. 1. Threats to Mediterranean Sea Turtles

Sea turtles mate in April and May in shallow waters close to their nesting sites. Sea turtles lay their eggs between May and August. The size of the eggs is similar to size of a ping-pong ball. There are approximately 70 eggs in a nest. The depth of the nests is around 50 cm. Hatchlings emerge from the nests after 2 months incubation period. The life cycle of the sea turtles in the Mediterranean is presented in Figure 2.

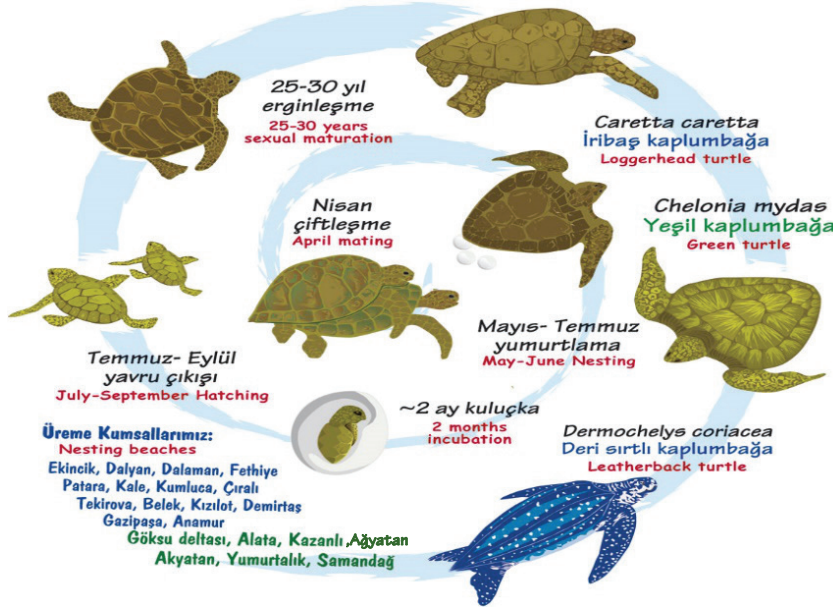


Figure2 : Life cycle of sea turtles

It seems that sea turtles in the Mediterranean are mainly threatened by degradation of their nesting habitat through beach development and tourism. Different strategies for the conservation of sea turtles have been reviewed by Pritchard (1980). These strategies are;

1-) The passage of laws to prevent sea turtles from featuring in international commerce,

2-) The protection of nesting female turtles from poaching by the establishment of beach patrols,

3-) The movement of eggs to beach hatcheries or to artificial incubators such as Styrofoam boxes with release of hatchlings as they emerge,

4-) Maintaining hatchling turtles in captivity for a period of time until they have grown sufficiently to be deemed safe from the majority of hatchling predators (head-starting),

5-) The distribution of hatchlings (or eggs) from a healthy breeding population to areas where the turtles have disappeared.

Pritchard's list is, however, incomplete. For example, artificial light can seriously disturb the breeding behaviour of adult nesting females and the water finding behaviour of the hatchlings (Frazer, 1986), but protection of nesting beaches against photo pollution is not included in the five categories of sea turtle conservation plans discussed by Pritchard (1980). The installation of artificial light should be considered as habitat destruction and is likely to adversely affect the local sea turtle population.

Sand extraction, vehicular pressure, beach erosion, litter, tar and oil, and high tides can all affect nest excavation, incubation, development of embryos and hatching. Most beaches in Turkey have on the high beach a conspicuous strip of oil and tar, carried by storms. Tar bars are also present under the surface of the sand. It has been suggested that turtles may mistake marine debris for edible items: plastic bags appear like jellyfish in the water, and jellyfish are more common in the diet of some marine turtles (Grammentz, 1988).

Excessive rainfall and / or inundation can indirectly affect natural turtle nests by lowering the ambient sand temperature,

thereby increasing the incubation period. Inundation can also harden upper sand layers, slowing the digging efforts of emerging sea turtle hatchlings. Fishing nets, speed boats and lines cause trouble to adult turtles in the sea as they may become entangled and drown.

Natural predation is one of the most important problems for the eggs and hatchlings of loggerhead turtles. At many sites around the Mediterranean, predation by mammals has also been a major cause of egg and hatchling mortality. Similar results were also recorded from the Turkish beaches.



Another species predated the eggs of the loggerhead turtles is golden jackal (*Canis aureus*). This species is mostly effective on the eastern beaches where the green turtles mainly nest. Cages over nests can be used in order to avoid fox predation (Canbolat, 1991; Kaska, 1993; Baran et al., 1992, 1996; Başkale & Kaska, 2005). For the hatchlings, fox, crab, bird and strong sunlight and dehydration caused hatchling losses on the nesting beaches. The main threat to the beach is natural predation by fox on the nests and hatchlings of the loggerhead turtles.



Sea turtles mate in April and May in shallow waters close to their nesting sites.



Sea turtles lay their eggs between May and August. The size of the eggs is similar to size of a ping-pong ball. There are approximately 70 eggs in a nest. The depth of the nests is around 50cm.



**Hatchlings emerge from the nests
after 2 months incubation period.**

1. 2. Sea Turtles in The Mediterranean and Turkey

Previous studies showed that 5 sea turtle species are living in Mediterranean (*C. caretta*, *C. mydas*, *E. imbricata*, *D. coriacea* ve *L. kempii*), (Başoğlu, 1973; Groombridge, 1990). Only two of them (*C. caretta*, *C. mydas*) are nesting in Turkey (Baran, 1990; Baran et al., 1991, 1992; Baran and Kasperek, 1989; Başoğlu, 1973a; Canbolat, 1991; Geldiay, 1983, 1984; Geldiay and Koray, 1982; Hathaway, 1972). Also a few leatherback turtle, *D. coriacea*, were found in Turkey's shore (Baran et al., 1998; Taşkavak et al., 1998; Sönmez et al., 2008).

Estimated number of adult female *Caretta caretta* is about 60.000 in all over the world and 2.000 for Mediterranean. Of these 450-900 *C.caretta* are using Turkey as a nesting site. The number of adult female *Chelonia mydas* is estimated as 200.000 in the world and only 500 of them are living in Mediterranean and of these 230-380 *C.mydas* are nesting in Turkey (Broderick et al., 2002; Canbolat, 2004; Kaska et al., 2005; Türkozan and Kaska, 2010).

1.3. Sea Turtle Studies in Turkey and Fethiye Beach

Turkey has 21 important nesting beaches and recently presented some important results in the national sea turtle symposium and reports (Türkozan & Kaska, 2010) (Fig. 3).

Sea turtles take first place about awareness among endangered species. Thus, they are accepted as flagship species for playing important role for both species protection and environmental protection. Although there are 2 sea turtle species (*C. caretta* and *C. mydas*) nesting in Turkey, *C. caretta* (loggerhead turtle) is well known in comparison with *C. mydas* (green turtle). Loggerhead turtles are mostly using western part of Turkey's Mediterranean coast for nesting while green turtles are using eastern part of Turkey's Mediterranean coast (Table 2).

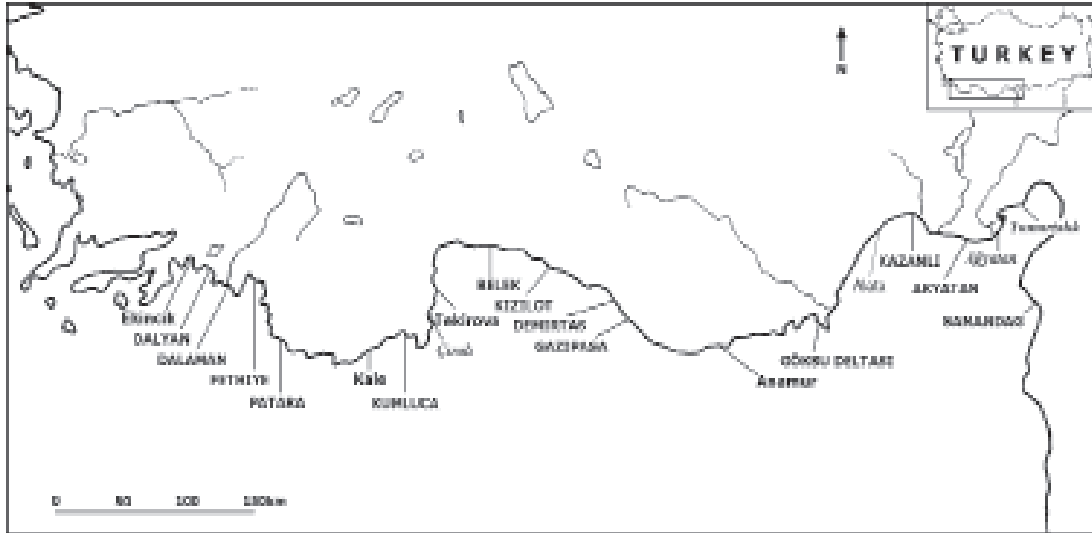


Figure 3: Important sea turtle nesting beaches in Turkey (Türkozan & Kaska, 2010) 1; Ekincik, 2; Dalyan, 3; Dalaman, 4; Fethiye, 5; Patara, 6; Kale, 7; Kumluca, 8; Çıralı, 9; Tekirova, 10; Belek, 11; Kızılot, 12; Demirtaş, 13; Gazipaşa, 14; Anamur, 15; Gökusu, 16; Alata, 17; Kazanlı, 18; Akyatan, 19; Yumurtalık, 20; Samandağ, 21; Ağıyatan

Table2 : Nesting size of the beaches for *Caretta caretta* and *Chelonia mydas*
(see Figure 4 for beach numbers)

	Beach name	Length of the beach	The range of nests numbers	
			<i>C.caretta</i>	<i>C.mydas</i>
1	Ekincik	1	9-12	
2	Dalyan	4,7	57-522	
3	Dalaman	10,4	69-112	
4	Fethiye	8,3	72-191	
5	Patara	14	35-127	2-2
6	Kale	8,5	39-109	
7	Kumluca	21	75-305	0-7
8	Çıralı	3,2	23-96	
9	Tekirova	3,7	4-23	
10	Belek	29,3	68-819	2-8
11	Kızılot	15,7	50-270	0-3
12	Demirtaş	7,8	41-137	
13	Gazipaşa	7	14-53	
14	Anamur	12,2	146-674	1-1
15	Göksu Delta	25,6	36-151	3-20
16	Alata	3	16-32	20-198
17	Kazanlı	4,5	2-26	73-403
18	Akyatan	22	3-31	108-735
19	Yumurtalık	6	1-1	1-3
20	Samandağ	14,2	7-20	20-440
21	Ağyatan	8,5	2-2	0-3

Nest numbers are given from 1993 to 2013 on Fethiye beach. The average nest numbers are estimated as 99 nests per years (Fig. 4).

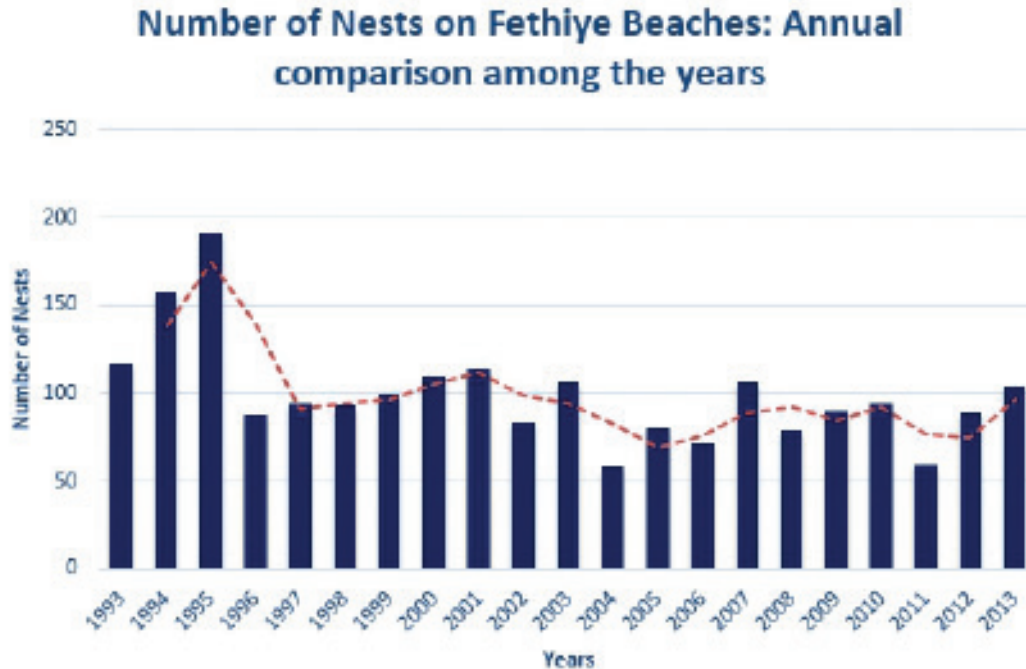


Figure 4: Annual Nest Numbers on Fethiye Beach (Türkozan and Baran, 1996; Baran and Türkozan, 1996; Türkozan, 2000; Yerli and Canbolat, 1998a; Türkozan, 2006; Ilgaz et al., 2007; Canbolat et al., 2006; Canbolat, 2007; Takva, 2008; Takva (Durmuş and Güçlü, 2009), 2009; Canbolat et al., 2010; Kaska et al., 2011; Başkale et al., 2012)

2.MATERIAL AND METHODS

2.1. Study Area

Statutes of the area in which it has;

- **Specially Protected Area**
- **Natural site Area**
- **Sea turtle nesting site**

Fethiye Beach was investigated as three parts (Fig. 5). These are; Akgöl section (1.1 km), Yanıklar section (4.9 km) and Çalış section (2.3 km).

2.2. Monitoring and Conservation of Sea Turtles

The general methodology on nesting biology of sea turtles and recording of the temperatures are carried out according to the previous published literature (Kaska et al., 1998; Başkale and Kaska, 2005; Türkozan and Kaska, 2010). Few pictures from the field work are given in Figure 6-8.



Figure 5: Map of Fethiye Beaches



Figure 6 :Some examples from our fieldwork
a) Adult Female turtle b/c) Morphometric measurements of a female turtle
d) Tagging e) Hatching

• Informative signs placed on the beach



• Public awareness studies



Figure 7 : Examples of public awareness studies



Figure 8 : Rescuing of injured turtles in the bay of Fethiye and their transportation to DEKAMER

3. RESULTS

3.1. Sea Turtles



Breeding and nesting activities of Sea Turtles on Fethiye Beach, which take place in Fethiye-Göcek Special Environmental Protection Area, were studied in 2013 nesting season. A total of 258 emergences, all of which belongs to loggerhead sea turtles, occurred in 2013, of which 104 (40.31 %) nests were deposited and the remaining 154 (59.69 %) non-nesting emergences. GPS records of the nests were recorded as and the distances of emergences from the sea were also measured.

Mean nesting density was 12,53 nests/km in 2013 for the length of 8,3 km long beach. Mean depth of the nests was

40.99 cm, diameter of egg chamber was 20,95 cm with a mean clutch size of 77,92.

A total of 12 nesting females were tagged, 3 of them re-observed during their second nesting.

The nests were caged against predation and human activities. A total of 35 nests were caged against human activities and against predators. Hatching was observed in 102 (98,08 %) of the nests and only 2 nests were not produced any hatchlings.

After excavating the nests, a total of 8104 eggs were counted, of which 601 of them were unfertilized. 1467 dead in shell embryos and 6036 empty eggshells that produced hatchlings. The hatching success was calculated as 91,99 % (Fig. 9/ 10).

For the public awareness, monthly meetings with hotel owners and personnel have taken place and PowerPoint presentations were also made to the tourists and visitors. This public awareness champagne for both local and international tourists was active every night at Caretta Info Desk on Calis beach.

3.2. Spatial and temporal distribution of females emergences



Figure 10 : Examination of egg contentl during nest excavation

A total of 258 sea turtle emergences observed, of which 104 of them resulted with nest in 2013 nesting season. All of these nests were belong to loggerhead sea turtles. Nests were laid mainly in July. According to temporal distribution of nests; four nests in May, 31 nests in June, 57 nests in July and 12 nests in August were laid.(Fig. 11).

The most density of the nests are located between 15-20 m distance from the sea (Fig. 12).

There is not any nest within the first 5m distance from the sea. Majority of the nests occurred on Yanıklar sections (49 nests) and followed by Çalış (35 nests) and Akgöl (20 nests) (Fig. 13).

Total Emergences of 2013 Breeding Season on Fethiye Beaches

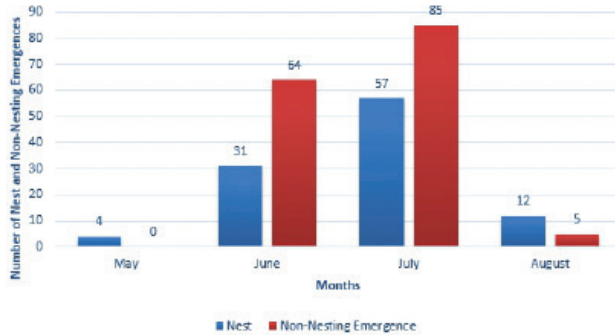


Figure 11: Temporal distribution of turtle activities on Fethiye beach

Number of eggs

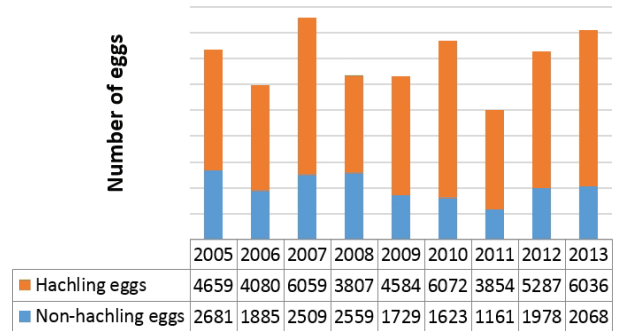


Figure 12 : The spatial distribution of turtle activities perpendicular to sea on Fethiye beach

Distribution of Nests on the Fethiye Beaches

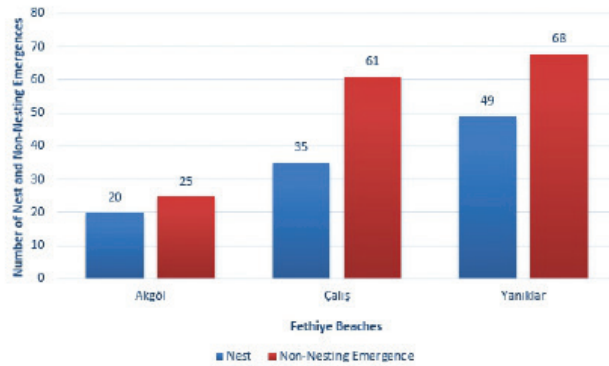


Figure 13: The spatial distribution of turtle activities perpendicular to sea on Fethiye beach



Figure 14: A hatchling crawling to the sea



Figure 15 : Distribution of nests on Akgöl sub-section

and tracks data were recorded and cages are located on newly occurred nests against to preadtaion and human effects in sensitive area of the beach.

Sea turtles tend to make nests an area on beach where, has topography of slots that allow a maximum output of hatchlings. For this reason, there are some important parameters related to beach slot. These are; the area and the beaches washed by a continuous wave effect, semi-wet wet from time to time under the influence of the length of the high waves,

For all nests, distance from the sea, continuous wave effect area and semi-wet area were measured, GPS data were recorded and signed on digital maps (Fig. 15/16/17/18). During night patrols nests



Figure 16 : Distribution of nests on Yanıklar sub-section

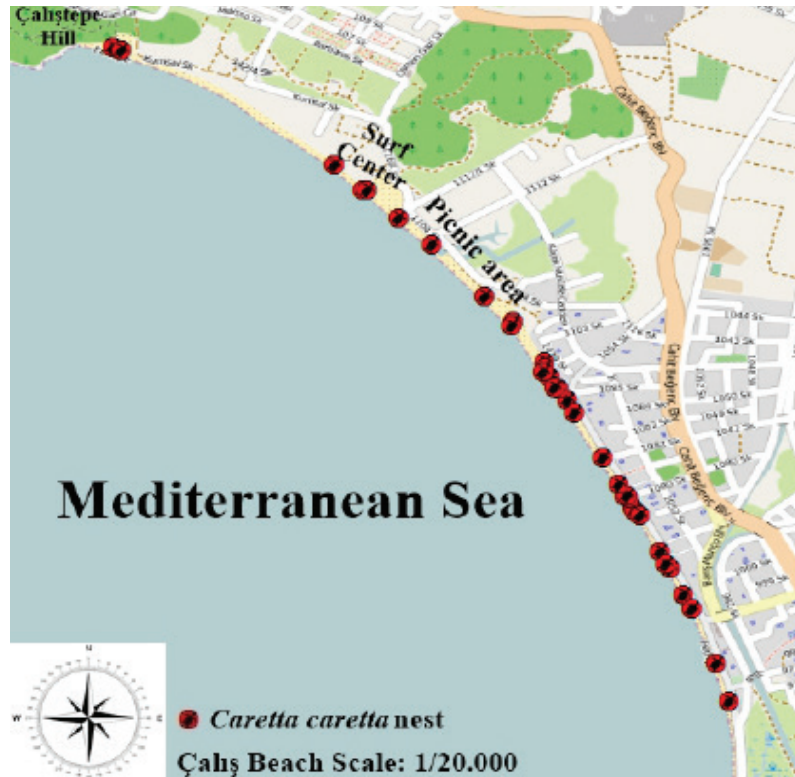


Figure 17 : Distribution of nests on Çalış sub-section



Figure 18: Map of the distribution of nests on Fethiye Beaches

3.3. Adult turtles and morphometric measurements

A total of 12 female were marked after laid their eggs and three of them were recaptured second time while emerge to beach for the purpose of nesting. Tagged animals from previous years was not observed .

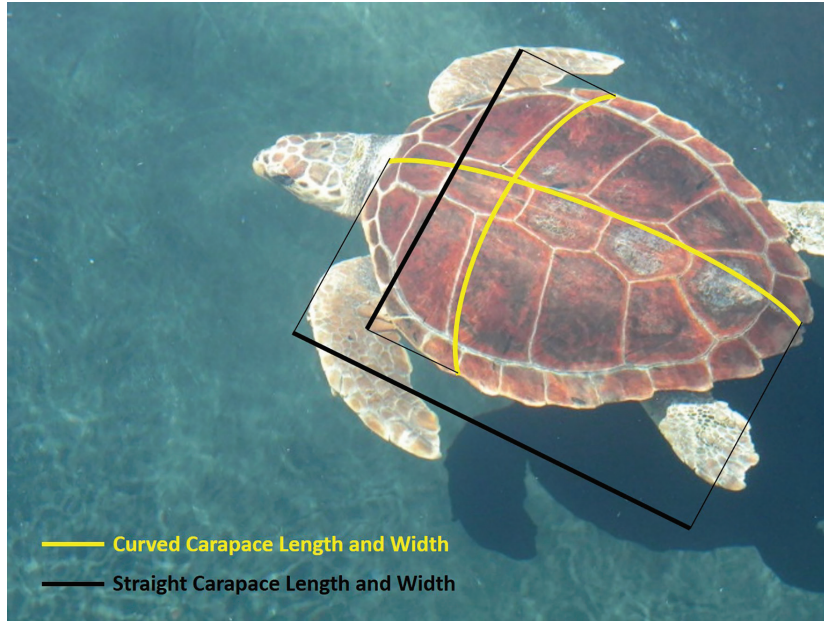


Figure 19 : Morphometric measurements of an adult turtle

3.4. Nests information on Fethiye beach

We have recorded 104 nests during the season of 2013 on Fethiye beaches. We caged 35 of them against human activity and predation. Hatching occurred in 102 of these nests.

A total of 8104 eggs were found in those nests. The number of unfertilised eggs were 601 and 1467 were found to be dead-in-shell embryos. Hatching success were calculated as 73 % (6036 hatchlings).

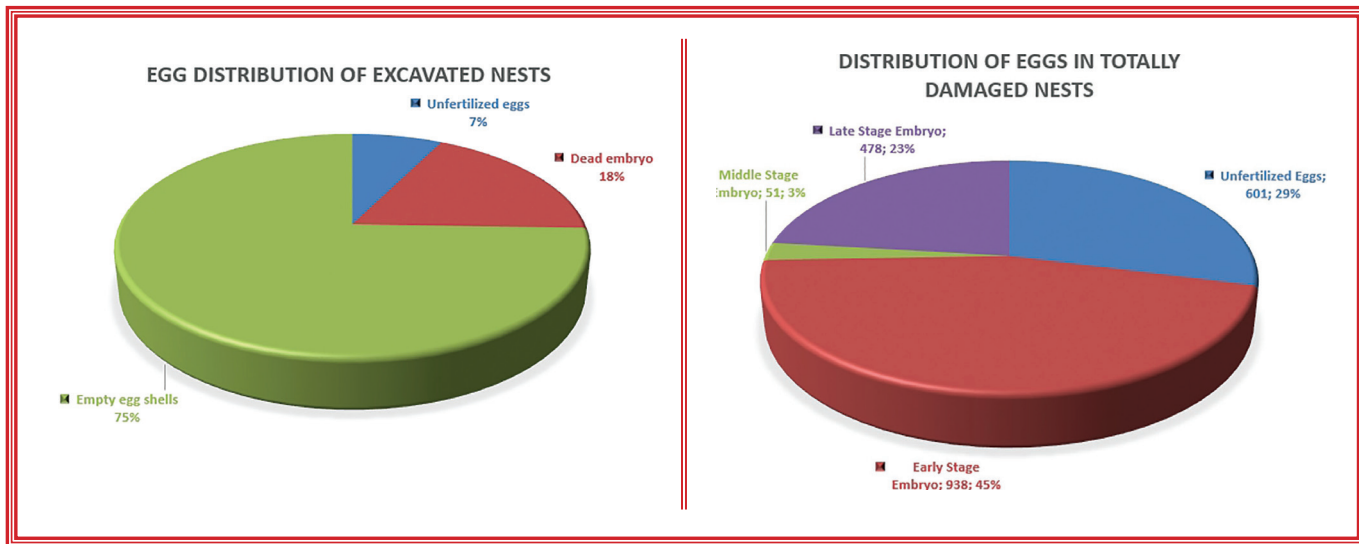


Figure 20 : General information of excavated nests

4. PUBLIC AWARENESS

To aim of sea turtle nests protection, hand leaflet were distributed local and foreign tourists and information signs were erected entrance of the beaches (Fig. 21). For the public awareness, meetings are arranged to hotel owners and

personnels and PowerPoint presentations were also made to the tourists and visitors. This public awareness champagne for both local and international tourists was active every night at Caretta Info Desk on Çalıř beach every night between 21 and 24 hours from June to September.



Figure 21 : Informative beach signs

Monthly meetings were organised with Tourists and tourism stakeholders and their personnels. Introductory presentations about sea turtles and biodiversity were given to those audiences.

A total of 4000 leaflets were given during these meeting. Three informative signs were erected to the entrance of the beaches (Fig. 22-23).



	DENİZ KAPLUMBAĞI ÜREME ALANINDAKİSİNİZ YOU ARE ON THE NESTING BEACH OF MARINE TURTLES	
	20:00-08:00 SAATLERİ ARASINDA KUMSALA GİRİLEMEZ NO ENTRY TO THE BEACH BETWEEN 08:00 PM- 08:00 AM	
	DENİZ KRAN ŞEMŞİYE HATTININ ÜZERİNDE GÜNEŞLENİLMEZ NO SUNBATHING BEHIND THE UMBRELLA ROW NEAR THE SEA	
	ÇEVREYİ KİRLİTMEYİNİZ, GÖREVLİLERİN İZLENİMLERİNE UYUNUZ DO NOT LITTER, FOLLOW OFFICIAL WARNINGS	
 T.C. ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI TABİAT VARLIKLARINI KORUMA GENEL MÜDÜRLÜĞÜ MINISTRY OF ENVIRONMENT, URBANIZATION AND CLIMATE CHANGE GENERAL DIRECTORATE FOR PROTECTION OF NATURAL ASSETS		

Figure 21 : Informative beach signs

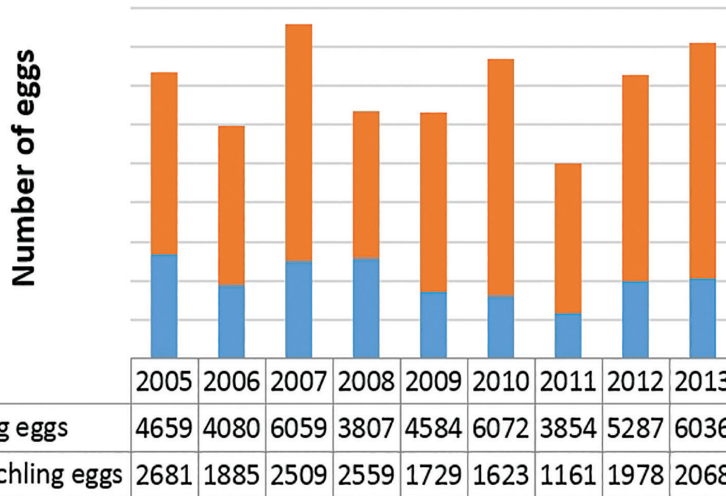


Figure 22 : Public awareness studies

5. DISCUSSION AND SUGGESTIONS

5.1. General Evaluation

A total of 104 nests were deposited in 2013 nesting season while average nest number was 91 for Fethiye Beaches over the last 20 years.



Hatching success of the nests varied between 60% to 80% in 2013 as it was reported in previous studies for Fethiye beach.(Fig. 23). Hatching success in last 9 years are given respectively from 2005 to 2013; 63,5%, 68,4%, 70,7%, 59,8%, 72,6%, 78,9%, 76,8% and 72,7%.

Figure 23 : The comparison of the hatching success and eggs distribution in Fethiye Beaches during the last nine years

5.2. Suggestions

In general, the sea turtles nest in Fethiye Beach is a sandy beach as well as tourism activities are held each season because of some troublesome situations arise in terms of sea turtles.



For this reason, information and activities on the beach as well as its follow-up work for the continued protection and monitoring should continue. Suggestions have been made regarding the solutions to the problems encountered in itemized below. Suggestions have been made regarding the solutions to the problems encountered in itemized below.

5.2.1. Studies about nesting line

Problem: Multiple rows of dense sunbeds and umbrellas need to be rearranged and reduced to allow nesting turtles to access the beach and hatchlings to reach the sea. Fixed structures, such as pavilions and cabanas should not be allowed (Fig. 24).



Figure 24 : Sunbeds on nesting zone



Figure 25: All sunbeds rearranged on the nesting line

Precaution: Before nesting season, we made a meeting with FETAB director about nesting season. We took some decision together. After 20:00 o'clock at night, all sunbeds rearranged in an upright position and secured or rest on the umbrellas. There are only two rows of the beach umbrellas allowed on Çalış beach. The first row is at the back, within the 3 meters from the wall behind the beach. The second row is near the sea and within the five meters from sea. The beach zone between these two rows of umbrellas is closed to the usage of umbrellas and/or beach chairs (Fig. 25).

5.2.2. Sand excavation should not be allowed on nesting line

Problem: Mechanical beach ploughing or sand extraction should be prohibited.

Precaution: Mechanical beach ploughing was forbidden. Any attempt of such negative activities were reported to the related authorities (Fig. 26).



Figure 26 : Some examples negatively affected nesting line

5.2.3. Cleaning and managing of beach should be done under control

Problem: Litter; a coordinated effort can be pursued so that beach clean-ups combined with awareness raising among locals can be conducted at the start of the nesting season and at the end of hatching season. Litter poses a major and lethal threat to hatchlings as it attracts predators and entraps hatchlings on their way to the sea.



Figure 27 : Garbage on the beach

Precaution: Before nesting season, we contacted with FETABs director for pick up the litter regularly the litter.

5.2.4. Vehicle access to the beach

Problem: Vehicle and visitor access problems need to be tackled effectively. Parking space: appropriate areas that would not involve the flattening of dunes and removal of natural vegetation should be chosen.



Figure 28 : Vehicle on the beach

Precaution: Access of vehicles was stopped according to our suggestions by making a barrier by ditch digging by municipality workers. Drivers are informed and warned when there is an access to the beach. Appropriate areas were designed a parking area for cars.

5.2.5. Light Arrangement on the Beach Bars and Discos

Problem: Lights; business owners should be required to screen or paint with dark colours all lights shining onto the beach that cannot be switched off during night hours during the nesting and hatching season. Light show equipment should be prohibited.



Figure 29 : Meeting with bussiness ship about problem

Precaution: Before nesting season, we made a meeting with bussiness ship and manager of ÇALIŞ-DER. All the visible lights of the hotels and restaurants from the beaches are removed, screened and/or painted as black after contact with them.

5.2.6. Regulation of water sports and speed boats



Problem: Speed restrictions and zoning should be applied to avoid injury of sea turtles.

Precaution: Fisherman and water sport owners were asked to apply all code of conduction especially five mile away from the coast line.



YOU SEE THE DIFFERENCE.
A TURTLE DOES NOT.

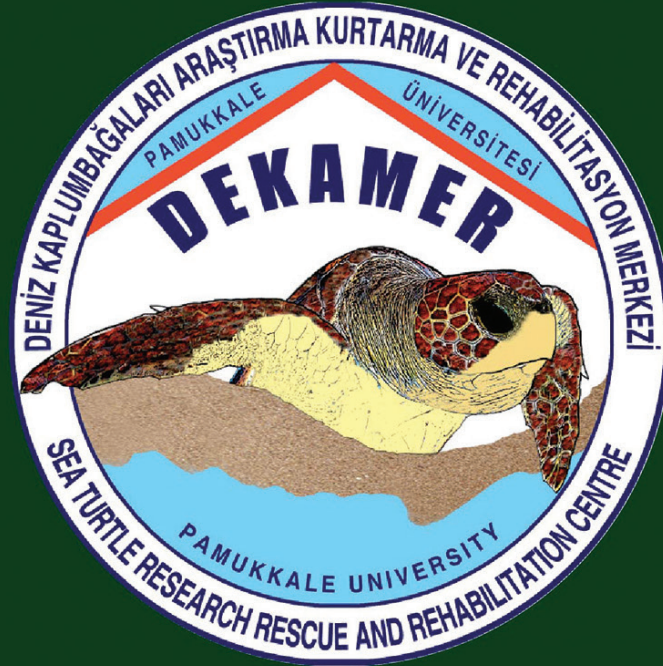
Protection efforts should be continued as a whole. Being recorded of the nests was started in May first time in many years.

The 104 is one of the highest as a number of nests. This increase may be caused by the attendance of new female adults to the population.



Figure 28: Sea turtles mistake plastic bags for jellyfishes and suffocate

LÜTFEN YARALI DENİZ KAPLUMBAĞASI GÖRÜNCE HABER VERİNİZ.
PLEASE INFORM US OF ANY INJURED SEA TURTLES



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Caretta caretta

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Caretta caretta

For sustainable seas, please help protect the Caretta caretta...



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