# CHANGES ON ÇALIS BEACH 2012

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KURZFASSUNG

Eine der größten Bedrohungen für Meeresschildkröten an der türkischen Mittelmeerküste ist zweifelsohne die fortschreitende touristische Erschließung und die damit einhergehenden Veränderungen an den Niststränden der Region. Ungeachtet dessen, dass diese Strände als Schutzgebiet ausgewiesen sind, wird weiter expandiert. Das Projektpraktikum der Universität Wien in Kooperation mit türkischen Universitäten soll zum Schutz der Unechten Karettschildkröte (*Caretta caretta*) und ihres Habitats und zur Aufklärung und Sensibilisierung der Bevölkerung und der Touristen beitragen sowie wissenschaftliche Einblicke in den Lebenszyklus dieser bedrohten Art geben. Durch fotographische Dokumentation der Strandveränderungen und des Erhebens der Anzahl an Sonnenliegen und Schirme die in diesem Jahr aufgestellt wurden, konnte ein Vergleich mit den Daten aus vorhergehenden Jahren erzielt werden und der zunehmende Einfluss des Tourismus auf Meeresschildkröten demonstriert werden. Dabei wurde eine Zunahme an Sonnenliegen (um 29,8 %) sowie an Schirmen (um 52 %) in Çiftlik festgestellt. In Çaliş hingegen zeigten die Daten eine Reduktion sowohl an Sonnenliegen (um 32 %) als auch an Schirmen (um 28,5 %). Insgesamt wurden mehr Sonnenliegen bzw- Schirme gezählt, als im Jahr zuvor (Sonnenliegen: 2011:1624, 2012:1627, Sonnenschirme: 2011:711, 2012:773). Wie in den letzten Jahren, wurden auch heuer erschwerte Bedingungen für die Eiablage der Meeresschildkröten beobachtet. Diese sind vor allem großflächig ausgelegte Teppiche direkt am Strand (Abb.20), Autos (Abb.6), bauliche Maßnahmen wie zum Beispiel die Fertigstellung der neuen Hotelanlage „Jiva Beach Resort“ und die Errichtung zahlreicher Rettungsschwimmertürme und Duschkabinen entlang der Promenade (Abb.8,12,13 und 14) sowie das Ablagern von Müll (Abb. 17 und 18). Ein zusätzliches Hindernis für nistende Tiere stellen Akazien dar, deren dickes, weitverzweigtes Netz aus Wurzeln die Eiablage erschweren kann. Neupflanzungen werden jährlich beobachtet. Insgesamt überwiegen die negativen Auswirkungen auf das Nistverhalten der Unechten Karettschildkröte. Eine positive Neuerung stellt allerdings das nächtliche Hochklappen der Sonnenliegen entlang der Promenade von Çaliş dar, welches den Tieren den Zugang zum Strand erleichtert.

ABSTRACT

Touristic development is one of the major threats facing sea turtles along the coastline of Turkey. As the example of Çaliş beach shows, the establishment of Special Protected Areas does not prevent further expansion of tourism infrastructure. Therefore, students from the University of Vienna and several Turkish universities have been working together since 1993 to help monitor preserve the Loggerhead Sea Turtle (*Caretta caretta*) populations through research, education and protection of their natural habitats. By documenting changes on the beach and collecting data on the number of beach furniture set up, the team demonstrated the growing impact of tourism on sea turtles. As in previous years, new building projects and beach furniture was observed, particularly in the Çiftlik section of Çaliş. Compared with the previous years, the total numbers of sunbeds and umbrellas recorded for the year 2012 have not changed much. The number of sunbeds in 2011 was 1624, whereas this year, 1627 were counted. The number of umbrellas increased from 711 to 773. However this promising stable beach furniture number in Çaliş Beach was not present in Çiftlik area. In 2012, sunbeds in Çiftlik increased by 29.8% and the number of umbrellas increased by 52 %. Although the overall number of beach furniture remained almost the same as the previous year, other obstacles that may prevent a female loggerhead sea turtle from nesting were documented, e.g. extensive carpeting and cars on the beach (Fig.20) as well as the construction of the new hotel "Jiva Beach Resort" and other facilities such as lifeguard towers and showers along the promenade (Fig.8, 12, 13 and 14) and garbage dumping (Fig.17 and 18). Another frequent obstacle besides sunbeds and parasols that disturb nesting of the sea turtles is acacia trees. These recently planted acacia trees make it difficult to dig a nest near the trees because of their long, thick-branched and extensively forking roots. Overall, the development in Çaliş beach remains a negative factor for the sea turtles. One notable improvement in Çaliş was the turning of all sunbeds on their sides at night in order to not block the passage of female adults. This was the sole change for the better.

## INTRODUCTION

Çalış beach is one of the most popular tourist beaches in the Fethiye area and thus a center of attraction for local residents and tourists from all over the world. It is also one of the 20 nesting beaches of *Caretta caretta* along the Mediterranean southwestern coast of Turkey (Margaritoulis

et al. 2003). Besides Dalyan and Patara, the main nesting beaches in Turkey, Çalış beach is also located in a Special Protected Area (Council of Ministers' Decision 88/13019, 12.06.1988). There are 2 beaches in particular: Çaliş Beach, which is divided into the Çiftlik section and the Çaliş promenade section, and the beach in Yaniklar with its 2 sections Akgöl and Yaniklar. Both are part of our investigations along with Pamukkale University. Austrian students and Turkish students patrolled the beach in three shifts (see Materials and Methods). Besides collecting nesting and hatching data, the students also documented the general condition of the beach by measuring light density and temperature and observing changes regarding the setup of beach furniture and construction work. Furthermore, sunbeds and parasols were counted to compare the numbers with those from previous years. Significant changes on the beach, such as new buildings, additional carpeting or other structures, which may have a negative, effect on *Caretta caretta* nesting and hatching, were also documented. Tourism is a dilemma in the conservation of *Caretta caretta* (IUCN Red List category "Endangered" since 1996). On one hand, it is a tremendous agent for attracting attention to the cause of sea turtle protection. On the other hand, it is the main problem sea turtles are facing. The number of hotels, bars, and restaurants has increased steadily to supply the touristic demand. This makes the habitat of sea turtles more and more limited and unnatural. According to natal homing hypothesis, female sea turtles return to the same beach where they hatched to lay their own eggs (Bowen et al. 2004). This is the reason why each natural habitat must be protected. The main problem adult Loggerhead sea turtles ace during nesting time is the disturbance by people during the night. Although it is prohibited to enter the beach during the night, many tourists and residents camp on the beach, light bonfires and listen to loud music. All of these factors scare off the adult females and make them return to the sea before laying eggs. Sunbeds, umbrellas and trees planted at the beach not only physically hinder the nesting of loggerheads; they also indirectly harm the hatchling development inside the nest. Beach furniture and trees produce shade, which can change the sand temperature and thus influence the development of the eggs. Another big problem hatchlings in Çaliş encounter is artificial,(see Bachelor thesis "Light pollution along the beach promenade in Çaliş, Turkey" in this report). Naturally, hatchlings orient themselves towards the brightest horizon, which is moonlight reflected on the water surface. However, in Çaliş hatchlings are easily distracted by the strong lighting of the promenade. To overcome this problem and to ensure that they safely reach the sea discovered nests are protected with cages. Nonetheless, not all of the nests are discovered from the onset, so that such so-called "secret nests" still remain endangered.

## MATERIAL AND METHODS

Students from the University of Vienna and from the Turkish partner University, Pamukkale University, observed the nesting behavior of *Caretta caretta* (Loggerhead sea turtle) in Çalış beach between 30 June and 4 September 2012 (with Turkish students being present earlier as well). Every day, groups of students patrolled the beach in three shifts. The first group walked the beach starting at 6 a.m. and, besides checking nests, they triangulated the protective cages to make sure that they were not moved. The first night shift started at 10 p.m., followed by a second shift at 12 p.m. (lasting until approx. 2 a.m.). During night shifts, students walked the beach and checked nests (using weak red lights if necessary). Furthermore, sunbeds and umbrellas were counted and the numbers compared with the results from previous years (Fig.1). For this purpose the beach was divided into 2 sections: Çiftlik and the promenade of Çaliş. On 25 August, sunbeds and umbrellas along the promenade section, starting from "Cafe Bahane" were counted. The values were compared with the numbers given by the operator of this beach area, FETAB (Fethiye Turizm Altyapi Hizmet Birliği) and the Fethiye Union of Tourism and Infrastructure. In the Çiftlik area, where sunbeds belong to different facilities, they were counted for the respective bars and restaurants. Photos of the sunbeds, parasols, beach huts and of other changes on the beach were taken by students and compared with those photos from previous years (See appendix)

## RESULTS

Unlike previous years, the total numbers of sunbeds and umbrellas recorded for the year 2012 have not changed much. According to FETAB (Fethiye Union of Tourism and Infrastructure), which is responsible for the setup of beach furniture, there are 410 sunbeds and 205 umbrellas on the beach of Çaliş. This shows a major mismatch with the counts carried out in 2012, where a total of 1627 sunbeds and 773 umbrellas where counted by students of the University of Vienna. As Fig.1 shows, the total number of sunbeds in 2011 was 1624, whereas this year, 1627 were counted. The amount of umbrellas increased from 711 in 2011 to 773 in 2012. Taken together, this indicates only a moderate total increase of sunbeds and umbrellas. Nevertheless, examining the counts more closely reveals a considerable imbalance between the 2 different beach sections Çaliş promenade and Çiftlik. In 2012, sunbeds in Çiftlik increased by 29.8%, whereas in Çaliş a reduction by about 32% was recorded. The number of umbrellas increased by 52% in Çiftlik and declined by 28.5% in Çaliş (Fig.2). Table 1 provides an overview of beach furniture counted this

year in Çiftlik. Whereas the trend at Çaliş beach is moving from multiple- towards single-rowed beach furniture, negative changes such as touristic development in Çiftlik continues. The new 5 star beachfront hotel "Jiva Beach Resort", comprising of 135 rooms, opened its doors this summer and destroyed the last remaining section of this former wetland area. The associated beach section was used to set up another 134 sunbeds, 62 umbrellas, a sunshade roof with carpets and a lifeguard tower. Furthermore, the restructuring of the former "Birlik Restaurant" (renamed in "Turkuaz Garden Beach") led to a more intensive utilization of the adjoining beach stretch. Although the number of sunbeds and umbrellas remained the same as the previous year, the setup of tables, benches and a volleyball pitch was recorded, which reduces the potentially available nesting area (Figs.8 and 9). The number of sunbeds at "Caretta Beach Bar" (former "Mimoza Beach Club") increased to 125.

Tab.1: 2012. Number of sunbeds and umbrellas counted in Çiftlik
Tab.1: 2012 Anzahl der Sonnenliegen und Schirme in Çiftlik

| **Location** | **Sunbeds** | **Umbrellas** | **Observations** |
|---|---|---|---|
| Mekan Restaurant (former Otlantic) | 70 | 13 | 11 big umbrellas<br>2 small ones |
| Turkuaz Garden Beach (former Birlik) | 45 | 21 | |
| Paradise Beach Restaurant (former Sand Beach Bar) | 58 | 29 | continuous rows of umbrellas; 19 bean bags |
| Mutlu | 55 | 27 | 2 continous rows of umbrellas; 10 fallen ones |
| Sunset Garden Beach Club | | | closed |
| Escape Beach Club (former Miss Dudu´s) | 51 | 15 | |
| Kutup Vildiz Hotel | | | 3 bungalows |
| Sörf Café | 124 | 83 | |
| Sörf Zone neu | | | |
| Sunset Beach Club | 102 | 52 | |
| Jiva Beach Resort | 134 | 62 | |
| Dirlic Café | 39 | 30 | |
| Onur Beach (former Kaan Beach) | 61 | 41 | |
| Güvens Restaurant | 71 | 37 | |
| Yöük Cadiri | 65 | 33 | |
| Yücel Hotel | | 2 | |
| Caretta Beach Club (former Mimoza Beach Club) | 125 | 54 | 191 bean bags/ fat pillows |
| **Sum Ciftlik** | **1100** | **499** | **210 bean bags/ oversized pillows, 3 bungalows** |

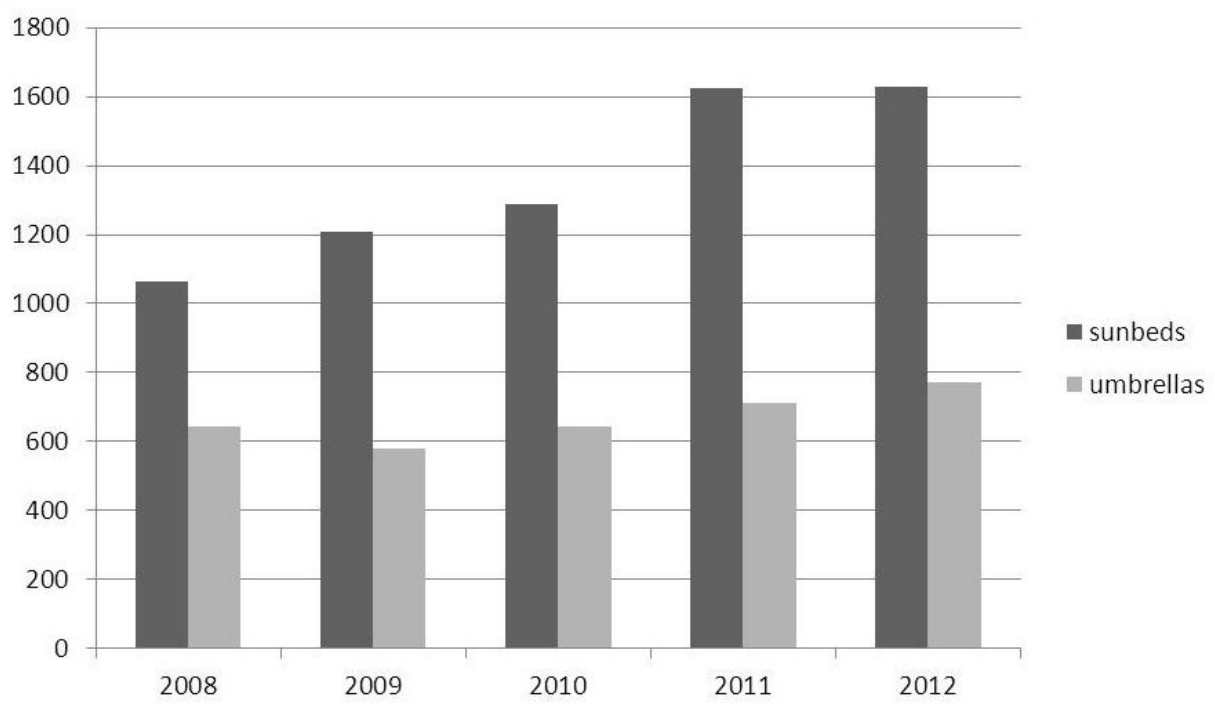


Fig.1: Number of sunbeds and umbrellas counted per year
Abb.1: Anzahl der pro Jahr gezählten Sonnenliegen und Schirme

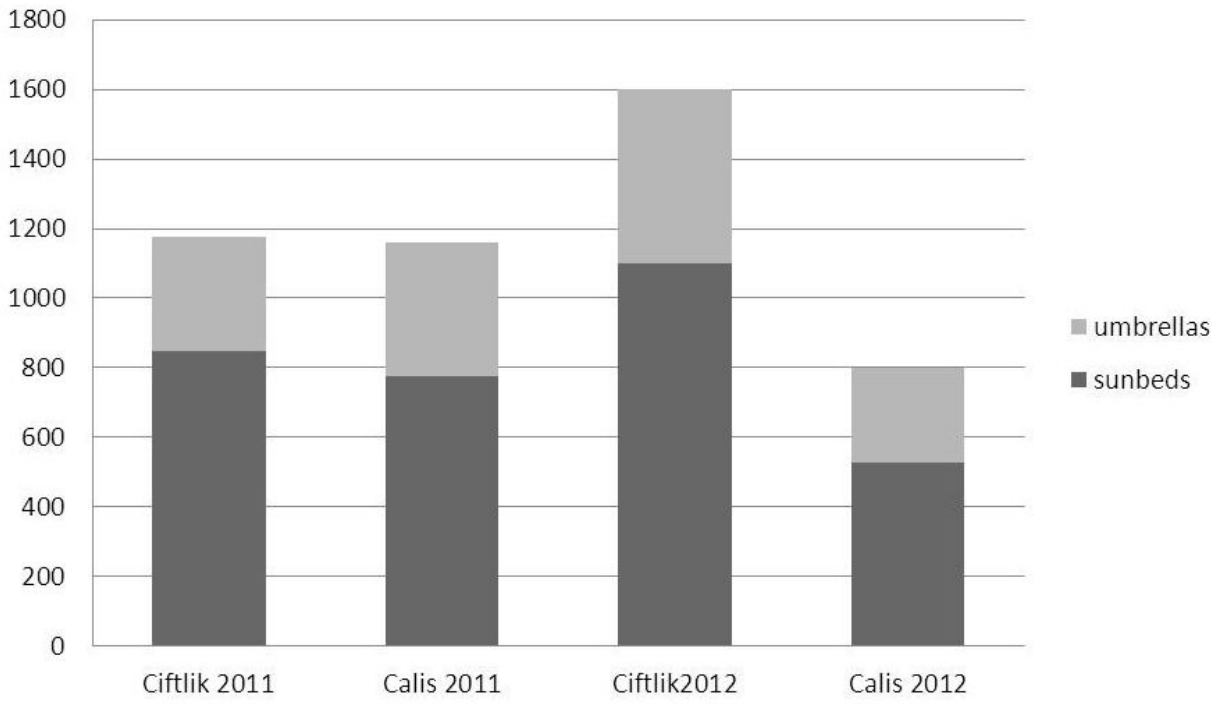


Fig. 2: Numbers of sunbeds and umbrellas in two different beach sections, Çaliş and Çiftlik
Abb. 2: Anzahl der Liegen und Schirme an zwei unterschiedlichen Strandabschnitten

A new structure on the beach this year is the hut in the Surf Zone which functions as a storage facility for watersport equipment and belongs to the nearby "Surf Café"(Fig.3). Additionally, carpets were placed on the beach in front of the storage hut leading directly to the waterline. Moreover, the wooden trailer next to the "Surf Café", which had been under construction since 2010, was completed. As Fig.7 shows, a new concrete patio and a path with stone plates leading from the trailer out to the beach were set up. Finally, a ditch measuring approximately 1 x 5 m was recorded close to the trailer and within the immediate vicinity of nests CS8 and CS9. Together, these developments mark another clear loss of sea turtle nesting habitat. Showers and lifeguard towers were installed at three locations on the beach in Çaliş. The water from these showers runs off directly onto the beach, which is known to affect the moisture and temperature of the sand and therefore impact nearby nests (Fig.11). Along the promenade of Çaliş Beach, plastic waste bins were installed at regular intervals on the beach (Fig.14). Most of the garbage was collected early in the morning, although overfilling during the day was frequent and attracted dogs, which increased the predation threat to hatchlings. In some parts of the Çiftlik section, trenches were dug to hinder vehicle access to the beach (Fig.4) in 2011, but most of the trenches had been filled up in 2012 (Fig.5) and those that remained were full of garbage. In addition, a frequent vehicle access onto the beach was observed Furthermore, the loss of the wooden information boards in the beach section of Çaliş was recorded (Fig.15). All the boards that were set up recently are still on their place (Fig.1).

## DISCUSSION

In the 18 years of this project, Çaliş beach had this year the fewest nests of all previous years. The promising incline of nest count in the last 4 years considered, we predicted to have a similar nest number. Actually the hope was that the nest count would increase. This expectation might be based on two points. The first involves the past fluctuations in annual nests, with the expectation that numbers would increase again after a low. The second is that that the presumably increased number of hatchlings that reached the sea with the onset of the beach monitoring efforts 18 years ago might begin to be reflected in an increasing number of adult females returning to their beach of birth for nesting. Sea turtles face numerous threats out at sea (e.g. motor boats, fishing

activities etc.). Perhaps one explanation for the continued decline is that mortalities at sea overweigh the increased number of hatchlings reaching the sea. The focus of the present study, however, is nesting and nesting beaches. Çaliş beach is a Special Environment Protected Area (SEPA) just like Dalyan and Patara beaches; however their conditions are poorly comparable. Only Dalyan and Patara beaches are considered important and regarded as beaches that matter for sea turtle Conservation in Turkey. However also in those beaches there are many problems in conservation, but even so they are far better protected than Çaliş beach. Nonetheless, Çaliş and its adjoining beaches in Yaniklar remain eminently important nesting beaches. This calls for stricter, compliance with the requirements of the Special Environment Protected Area here. The aim in Çaliş should be to at least maintain the current condition and to prevent further construction and other form of habitat deterioration. Another major aspect should be to inform tourists and other visitors. The information desk on the promenade is a good start, although only people with some level of interest and knowledge tend to stop by the info desk. There are also a few public information boards on the beach, which provide enough information on *Caretta caretta* life cycle and rules. However, they are not very effective as far as tourists are concerned because they are easily overlooked. A better idea was tried out this year, namely putting information about *Carretta caretta* and some points to consider for their conservation on the door signs in some hotel rooms in Çaliş. If this idea is further worked on in the coming years, it would make it possible to reach and inform more tourists. Not only the tourists, but also the hotel owners, bar owners, travel agencies, and local residents have to be informed better. Most of them are already aware that Çaliş beach is a nesting beach, but many fail to grasp the implications for human behavior or simply ignore the rules. Most of them use the beach as if there are no rules and without the smallest consideration of *Caretta caretta* nesting just to fulfill their own personal benefits. They place carpets (See Fig. 19) and diverse beach furniture to stand out from the other spots on the beach and so to attract more tourists. Furthermore they offer activities, like Quad Safaris (see Fig. 18), in which they drive all-terrain vehicles on the beach. This activity is especially dangerous for the secret nests on the beach, but also for the marked nests, since the cages may be overseen during such a fast activity. Briefing and encouraging cooperating better is essential. Their collaboration would really help in raising awareness and conserve the beach better.

Unfortunately, most of the observed changes in 2012 turned out to be negative, despite the fact that both beach sections are located in a Special Protected Area. Nonetheless, notable effort was made to turn all sunbeds on their sides at night, in order to not block the passage of female adults coming ashore for nesting. There is still hope for Çaliş beach. If the necessary actions are implemented rapidly, with everyone's collaboration, a lot can be changed over the long term. This change would require compromises and a lot of hard work, but it should be done for a better environment. Otherwise Çaliş beach will soon turn into an everyday, unexceptional tourist beach, free of any natural charm.

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APPENDIX

Fig.3: 2011. Formerly free stretch next to the trench
Abb.3: 2011. freie Strandfläche neben Graben
(Foto: M. Stachowitsch)

Fig.4: 2012. Storage hut with carpets in the background “Sunset Beach Club”
Abb.4: 2012. Lagerhütte inklusive Teppiche im Hintergrund „Sunset Beach Club“
(Foto: M. Stachowitsch)

Fig.5: 2011. Ditch and mound shielding cars from the beach
Abb.5: 2011. Graben und Erdwall als Sperre für Autos
(Foto: M.Stachowitsch)

Fig.6: 2012. Free access for cars to the beach
Abb.6: 2012. Zufahrt zum Strand möglich
(Foto: D. Bernolle)

Fig.7: 2011.Trailer on wheels under construction
Abb.7: 2011. Wohnwagen direkt am Strand
(Foto: D.Bernolle)

Fig.8: 2012. Construction work on the beach
Note concrete patio now extending from trailer
Abb.8: 2012. Baumaßnahmen direkt am Strand
im Hintergrund: an Wohnwagen angeschlossene Betontplattform
(Foto: M. Stachowitsch)


Fig.9: 2011. Free spot next to Restaurant Birlik
Abb.9: 2011. Freie Fläche neben Restaurant Birlik
(Foto: M. Stachowitsch)

Fig.10: 2012. Former free spot now also occupied by dense multiple rows of sunbeds and volleyball court
Abb.10: 2012. Verstellte Fläche, nun auch durch mehrere Reihen Sonnenliegen und Volleyball-Platz verstellt
(Foto: M. Stachowitsch)

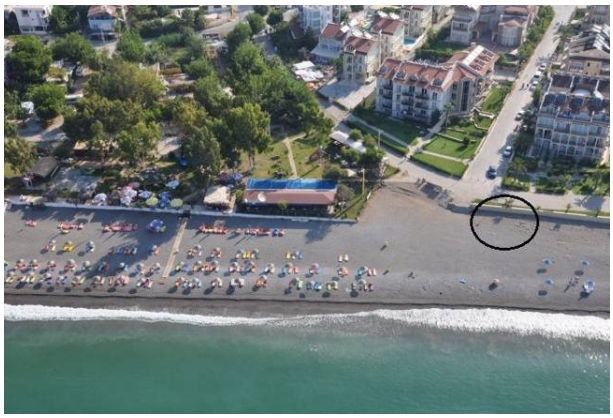

Fig.11: 2011. Free spot at the end of the promenade
Abb.11: 2011. Freie Fläche am Promenadenende
(Foto: M. Stachowitsch)

Fig.12: 2012. New hut, showers, lifeguard tower
Abb.12: 2012. Hütte, Duschen, Rettungsschwimmer Turm (Foto: M. Stachowitsch)

Fig.13: 2012. Beach furniture at the newly erected “Jiva Beach Resort”
Abb.13: 2012. Strandmöbel des neu errichteten Jiva Beach Resorts
(Foto: M. Stachowitsch)


Fig.14: 2012. New lifeguard tower and sunshade roof at Çaliş Beach
Abb.14: 2012. Neuer Rettungsschwimmer Turm und Sonnendach am Strand von Çaliş
(Foto: M. Stachowitsch)


Fig.15: 2011. Information boards in Çiftlik
Abb.15: 2011. Informationstafeln in Çİftlik
(Foto: M. Stachowitsch)

Fig.16: 2012. Çiftlik section.One board missing, only the posts of the second one remaining
Abb.16: 2012. Çiftlik. Ein Schild fehlt, nur die Pfosten des anderen erhalten

Fig.17: 2011.Ceramic pots used to collect garbage
Abb.17: 2011. Keramiktöpfe als Mülleimer
(Foto: M. Stachowitsch)

Fig. 18: 2012. Overfilled plastic bins at Çaliş on the beach Abb.18: 2012 Überfüllte Plastikeimer in Çaliş (Foto: M. Stachowitsch)


Fig.19: 2012. Add for Quad rides on the beach of Çaliş – another possible threat to nesting sea turles?
Abb.19: 2012. Werbung für Quad Touren am Strand von Çaliş – eine zusätzliche Gefahrenquelle für nistende Meeresschildkröten?
(Foto: M. Stachowitsch)

Fig.20: 2012. Extensive carpeting on the beach
Abb.20: 2012. Große Teppichflächen am Strand

# CHANGES ON YANIKLAR AND AKGÖL BEACHES, TURKEY 2012

Dominik Bernolle and Eva Schweiger

KURZFASSUNG

Die Universität Wien arbeitet seit 1994 mit verschiedenen türkischen Universitäten (2012 Pamukkale Universität, Denizli) zusammen, um die Niststrände der Unechten Karettschildkröte (*Caretta caretta*) in der „Special Environmental Protection Area“ (SEPA) Fethiye (Türkei) zu erhalten. Jeden Sommer versuchen österreichische und türkische Mitarbeiter des Projekts gemeinsam die Situation für nistende Meeresschildkröten an den Stränden Akgöl, Yaniklar und Çaliş bei Fethiye zu verbessern. Der Allgemeinzustand der Strände und die Probleme, die durch touristische Aktivitäten entstehen, wie Müll am Strand, Nutzung der Gewässer durch Wasserfahrzeuge, Fischerei, Beleuchtung des Strandes etc. werden notiert und mit den Daten der Vorjahre verglichen. In diesem Jahr wurden insgesamt 439 Sonnenliegen gezählt; im Vorjahr waren es 391 (exklusive der Liegen der Caretta Beach Bar). Abgesehen von einem Informationsschild innerhalb der Hotelanlage des Lykia Botanika Beach & Fun Club, waren alle 2011 aufgestellten Schilder schwer beschädigt oder verschwunden. Die im letzten Jahr ausgehobenen Gräben, die die Zufahrt zum Strand von Akgöl verhindern sollen, mussten erneut gegraben werden. Trotz dieser Bemühungen, Autos vom Strand fernzuhalten, wurden auch dieses Jahr wieder Autospuren in der Nestzone vorgefunden, und Nester überfahren. Auch die Wassersport-Aktivitäten waren 2012 weiterhin eine große Gefahr für Meeresschildkröten, vor allem aufgrund der großen Anzahl an motorisierten Wasserfahrzeugen. Auch die Fischerei mit Netzen in Strandnähe bleibt ein ungelöstes Problem.

Die Niststrände sind als Teil einer SEPA zwar gesetzlich geschützt, die Regulierungen greifen jedoch nicht effektiv genug um die Sicherheit der Schildkröten und ihrer Nester zu gewährleisten. Aufklärung von Touristen und Lokalbevölkerung über die Schutzbemühungen für die Unechte Karettschildkröte ist wohl eines der wichtigsten Mittel, um die Situation zu verbessern.

ABSTRACT

The University of Vienna has been involved in conservation of the loggerhead sea turtle (*Caretta caretta*) in the Special Environmental Protection Area (SEPA) Fethiye, Turkey, since 1994. Every summer, Austrian and Turkish project members from various universities (in 2012 Pamukkale University, Denizli) work together to maintain and improve the situation for nesting sea turtles on the three beaches Akgöl, Yaniklar and Çaliş near Fethiye. The general condition of these beaches as well as activities related to tourism, like littering, water sports activities, fishing, lighting of the beach etc. are noted and compared to data of previous years. This year, 439 sunbeds were counted in total, in 2011 there were 391 (number of sunbeds at Caretta Beach Bar not included). Apart from one information board inside the Lykia Botanika Beach & Fun Club hotel area, all boards erected last year were either damaged or missing. The ditches dug out last year in order to block access to Akgöl beach by car, had to be renewed this year. Despite of these efforts, vehicle tracks were found in the nesting zone and nests were run over. Water sports activities posed a major threat to sea turtles in 2012 as in the previous years, primarily due to the high number of motorized vessels. Fishing activity using nets close to the beach also remains an unsolved problem.

Even though the nesting sites are part of a SEPA, regulations are not effective enough to ensure the safety of the turtles and their nests. Education about the conservation efforts for the loggerhead sea turtle are a crucial means to raise the tourists' and the locals' attention of the problem and improve the situation.

INTRODUCTION

In Turkey, there are 14 known major nesting beaches of the loggerhead sea turtle (*Caretta caretta*), three of which are listed as Special Protected Areas (SPAs) (Bolton & Witherington 2003). One of these protected nesting sites, Fethiye, has been subject to research and conservation work by the University of Vienna in cooperation with various Turkish Universities (in 2012 Pamukkale University, Denizli). Nesting and hatching data, changes of the three nesting beaches near Fethiye (Akgöl, Yaniklar and Çaliş) and various key data have been recorded since 1994.

The beaches Akgöl (Fig. 1a) and Yaniklar (Fig. 1b & 1c) are located at the north-west of Fethiye and stretch for about 1.5 (Akgöl) and 4 kilometers (Yaniklar), respectively, along a partially drained wetland area. With only two big holiday resorts and some small camping sites and lodges as well as three beach cafés, they are far less developed in terms of

infrastructure for tourism than Çaliş beach. Nevertheless, many Turkish people use the beaches for recreation and leisure activities. The needs of tourists on one hand and sea turtles on the other hand therefore have to be balanced carefully.

Undisturbed nesting beaches are crucial for successful reproduction and survival of all sea turtles, including the loggerhead turtle. All around the world, sea turtles face man-made dangers, such as increasing pollution and disturbance of their natural habitats. Littering and destruction of nesting beaches by sand removal, construction works and various activities related to tourism, as well as light and noise pollution discourage female turtles from laying their eggs and pose great threats to the survival of eggs and hatchlings. Solidified sand directly above nests due to cars on the beach can trap hatchlings in the nest, lights can cause disorientation with fatal effects like their moving inland towards the light source, and litter can become a lethal trap, since hatchlings are incapable of moving backwards (Triessnig 2006).

In recent years, the main challenges for sea turtle conservation in Akgöl and Yaniklar have been prevention of overuse of the beaches and awareness raising for the life-cycle of the endangered *Caretta caretta* (IUCN Red List category "Endangered" since 1996). Austrian and Turkish members of the project have made much effort to improve, or at least maintain, the current condition of Akgöl and Yaniklar beaches in cooperation with local residents. Information boards were set up, entrances to the beaches were barred for cars, lights were covered on the side facing the beach or switched off during the night and the positions and numbers of sunbeds and parasols were improved.

## MATERIAL & METHODS

Between June 30 and September 15, project members from the University of Vienna were present in Yaniklar. During this time, small groups walked the beaches every morning (starting at sunrise around 6 a.m.) and every night (until hatching started on July 14 in Akgöl and July 17 in Yaniklar). Apart from recording nesting and hatching data, special occurrences (e.g. cars and car tracks on the beach, campfires, litter, stranded dead sea turtles, boats travelling at night, fishing activities, etc.) were documented by taking photos and notes. Furthermore, sunbeds and parasols were counted. Also, the position of the lights at the cafés and hotels as well as the times they were switched on and off were noted.

At the end of Akgöl beach, narrow ditches about 50 centimeters deep were dug using a spade in late July. By maintaining them during the rest of the summer, we hoped to prevent people from driving on the beach.

## RESULTS

### Condition of the beaches

In Akgöl (Fig. 1a), only a small portion of the beach is suitable for *Caretta caretta* nesting. The rest of the beach consists of coarse material and very little sand, especially along the water line, where cobbles ( > 64 mm) and stones dominate. By far the most (20) nests were found at the very end of the beach, between the (dry) outflow of the Agköl lake and cliffs. This part offers very fine sand and therefore optimal conditions for sea turtle nests. The hatchlings still faced some natural dangers, including crabs (Ocypodidae, Fig. 2) and predatory birds, such as ravens or sea gulls (Corvidae and Laridae). The latter foraged among the nests nearly every morning.

Seven nests were found on a sandy stretch about 150 meters before the outflow of the Agköl lake. Unfortunately, the quality of the substrate is suboptimal there; it consists mostly of coarse pebbles (> 10 mm) and contains little sand. The sandy area in the back of the beach, along the road leading to the former “Starfish Café” (Fig. 1a) is also suitable for sea turtle nesting but did not feature any nests this year.

One nest was found directly in front of Yonca Lodge (Fig. 1b), where the sand is fine. The 42 hatchlings emerging from this nest had to crawl over a patch of big cobbles before reaching the water.

On Yaniklar beach, most parts between Lykia Botanika Beach & Fun Club and the “lonely tree”, have only a small band of suitable sandy substrate directly in front of the vegetation. Between these patches and the water line, there are mostly cobbles and a belt of flotsam washed on the shore. The latter is about one to two meters wide, piles up to a about 40 cm in some places and consists of driftwood and all kinds of litter.

Between the “lonely tree” orientation point and former “Buffet Restaurant Akmaz” (Fig. 1c), the beach is very steep and consists nearly entirely of cobbles. Only in the back of the beach, beneath the pine trees of the “picnic area” (Fig. 1c), the ground is flat, sandy and a potential sea turtle nesting site.

Beyond former “Buffet Restaurant Akmaz” (Fig. 1c), the beach changes again. It becomes very flat and much wider compared to the other sections. Here as well, a zone of cobbles lines the water but there was hardly any flotsam. The sandy sections are partly overgrown with loose dune vegetation.
Finally, the so-called Small Beach (Fig. 1c) between Yaniklar and Çaliş beaches offers suitable conditions for sea turtle nests, like in previous years, but no nests were found there this year.

Ditches

In 2011, a row of stout wooden stakes was erected as a barrier for cars at the end of Akgöl beach (Fig. 3a) (Wiemers 2011). This year, none of these were present any more. The same holds true for the trenches dug last summer (Fig. 3b). While constructing new ditches in the same places this summer (Fig. 3c), wooden stakes resembling those used as the barriers last year were unearthed, apparently used to fill in the old trenches. One of the passages leading through the vegetation along the road was not barred by a trench. Therefore, people could still drive their cars on the beach, but since this passage was located about 100 meters down the road from the barred “main entrance”, most drivers did not reach the important nesting site at the very end of Akgöl beach.

Information boards

In 2011, new information boards depicting the life cycle of *Caretta caretta* and giving information about sea turtle conservation were set up near the Caretta Beach Bar, near former “Starfish Café” and inside the Lykia Botanika resort (Wiemers 2011). This year, only the board at Lykia Botanika Beach & Fun Club was still present; all others were gone or badly damaged (Fig. 4).

Lights

At Lykia Botanika Beach & Fun Club, the lamp closest to the beach was painted black on the side facing the beach in 2011. Unfortunately, the lampshade was not firmly attached and was turned such that the shading effect was compromised (Fig. 5). On a positive note, the lights on the jetties of Lykia Botanika Beach & Fun Club and Majesty Club Tuana were switched off during nighttime, like in 2011 (Wiemers 2011). Only one small warning light at the end of the Majesty Club Tuana jetty remained switched on during the night.

At “Caretta Beach Bar” close to the end of Yaniklar beach facing Çaliş (Fig. 1c), one single light on a very high lamppost caused severe disorientation of hatchlings from a nest nearby (Y3). They covered distances of up to 55 m between the nest and the lamppost and were later found dead on the way.

Vehicles and vehicle tracks

Like in previous years, tracks of cars, quads, motorbikes and other motorized vehicles were observed all along both beaches. On August 22, a bushfire devastated a big area of reed and trees directly behind Yaniklar beach. Apparently in order to contain and extinguish it, heavy fire trucks entered this stretch of beach. Unfortunately, they ran over one nest (Y2, Fig. 6) and left up to about 20 cm deep tracks. These tracks turned out to be a problem for the hatchlings of surrounding nests. After entering the truck tracks 18 followed them for up to 67 m parallel to the waterline before finally turning towards the sea (Fig. 7).

In front of Majesty Club Tuana a shovel excavator was observed several times in the early morning removing cobbles and creating a flatter, more sandy ground.

Fishing

In 2011, people were observed fishing with nets and rods from the beach and using small fishing boats (Wiemers 2011). This year, fishing activity was also observed; we recorded local residents using nets and lines from the beach but also small and medium-sized fishing boats trolling or net fishing as close as about 100 m off the beach. Some tourists were seen using fishing rods in shallow water along both beaches. On a few occasions, people were seen spear-fishing.

Especially between Yonca Lodge and Majesty Club Tuana and along the first few meters of Akgöl beach fishing nets were left in heaps. Some were covered by canvases, others were not.

Beach facilities

Majesty Club Tuana

Majesty Club Tuana is by far the biggest holiday resort in Akgöl and Yaniklar. They offer a full range of water sport and entertainment facilities on and next to the beach. This summer, 170 sunbeds set up in four rows beneath two rows of sun pavilions were counted (Tab. 1, Fig. 8a). In 2011, there were more sunbeds, which were set up in only two rows (Wiemers 2011,

Fig. 8b). The sun pavilions, which replace the parasols since 2010 (Wiemers 2011), were not counted this year. New wooden boardwalks were erected leading to the jetty and the hotel area and in front of the first row of sunbeds on one side (Fig. 8c). The sunbeds and pavilions stretched from the back of the beach about one third of the way to the water line. In the water, directly in front of this area and adjacent to the jetty, a rectangular swimming zone was enclosed by buoys.

Even though loud music was played at the disco inside the hotel grounds nearly every evening (until about 2 a.m.), the guests mostly stayed inside the hotel area and did not walk on the beach at night.

Tab. 1: Numbers of Majesty Club Tuana beach facilities in the years 2005-2012 (* no data, ** parasols replaced by sun pavilions of roughly the same size in 2010)
Tab. 1: Anzahl der Strandeinrichtungen des Majesty Club Tuana in den Jahren 2005-2012 (* keine Daten, ** Schirme 2010 durch Pavilions von etwa der gleichen Größe ersetzt)

| **Facilities** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
|---|---|---|---|---|---|---|---|---|
| Sunbeds | 214 | 248 | 310 | 326 | 268 | 233 | 201 | 170 |
| Sun pavilions ** | 33 | 33 | 33 | 33 | 33 | 40 | 34 | * |

Lykia Botanika Beach & Fun Club

The Lykia Botanika Beach & Fun Club uses a smaller stretch of beach and offers fewer facilities than Majesty Club Tuana. 145 sunbeds were set up in two rows beneath sun pavilions (Tab. 2). The latter replaced the parasols in 2010 (Wiemers 2011), but were not counted this year. On a positive note, the wooden boardwalk present in 2010 and removed in 2011 (Wiemers 2011) were not replaced, and the sunbeds and pavilions were located further back on the beach (Fig. 9)

The beach-volleyball court and the net, which was set up in 2007 (Wiemers 2011), were still present but hardly ever used. During nighttime, loud music was often played in the bar/dancefloor directly adjacent to the beach, but few people were seen at the bar at night.

Tab. 2: Numbers of Lykia Botanika Beach & Fun Club beach facilities in the years 2003-2012
Tab. 2: Anzahl der Strandeinrichtungen des Lykia Botanika Beach & Fun Club in den Jahren 2003-2012

| **Facilities** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
|---|---|---|---|---|---|---|---|---|---|---|
| Sunbeds | 151 | 144 | 150 | 153 | 134 | 191 | 157 | 157 | 120 | 145 |

Onur and Doğa Camps

The number of facilities at Onur and Doğa Camps changed little. At both camps, one sunbed less than last year was counted and neither had set up any parasols or wooden pavilions. In 2011, Doğa Camp had eleven sunbeds, this year only ten. At Onur Camp, there was one sun pavilion, like in 2011 (Fig. 10a) ( in 2010 there was no pavilion Fig. 10b); note that this elongate pavilion consists of 4 subunits (Tab. 3). There were no boardwalks on the beach.

Tab. 3: Number of beach facilities at Onur Camp in the years 2011-2012 (* no records; ** 2011 value changed, see above)
Tab. 3: Anzahl der Strandeinrichtungen des Onur Camps in den Jahren 2011-2012 (* keine Daten)

| **Facilities** | **2011** | **2012** |
|---|---|---|
| Sunbeds | 17 | 16 |
| Wooden pavilions | * | 0 |
| Parasols | 0 | 0 |
| Sun pavilions | 4** | 4 |

Yonca Lodge

In 2012, there were about as many sunbeds at Yonca Lodge as in 2011 (Tab. 4). One additional wooden pavilion was erected, so that there was one to the left and one to the right of the sunbed and dining area. Moreover, there were five parasols and nine new dining tables on the beach, the latter among trees (Fig. 11). In September, one secret nest was found directly in front of the sunbeds. Even though some lights on low lampposts were lit during nighttime, none of the hatchlings turned towards them. Before reaching the sea, they had to detour around a short boardwalk, which was laid across the pebbly zone close to the water line.

Tab. 4: Number of beach facilities at Yonca Lodge in the years 2011-2012 (* no records)
Tab. 4: Anzahl der Strandeinrichtungen der Yonca Lodge in den Jahren 2011-2012 (* keine Daten)

| **Facilities** | **2011** | **2012** |
|---|---|---|
| Sunbeds | 20 | 19 |
| Wooden pavilions | 1 | 2 |
| Parasols | * | 5 |
| Tables | * | 9 |

Former “Buffet Restaurant Akmaz” and “Caretta Beach Bar”

The “Buffet Restaurant Akmaz”, which was undergoing reconstruction in 2011 (Fig. 12a) (Wiemers 2011), was already finished at the beginning of July 2012. This year, no sign with a restaurant name was present. 33 sunbeds and four parasols were set up directly in the nesting zone of the beach (Fig. 12b), whereas there were no sunbeds and parasols in 2011 (Fig. 12a). Furthermore, a small shower was erected a bit further towards the Akmaz river (Fig. 12c). The Caretta Beach Bar at the very end of Yaniklar beach towards Çaliş was open as in 2011 and had 19 sunbeds and ten parasols. These were located close to the water like last year (Wiemers 2011). There were always four or five dogs present and straying along the beach.

Former “Starfish Café”

The former “Starfish Café”, located roughly in the middle of Akgöl beach, set up 27 sunbeds and seven parasols (Tab. 5) as well as a few empty umbrella stands close to the water line. In comparison to 2011, there were five more sunbeds but fewer umbrellas (Wiemers 2011). The wooden pavilions were still present but in a very bad condition .

Tab. 5: Number of former "Starfish Café" beach facilities in the years 2011 and 2012
Tab. 5: Anzahl der Strandeinrichtungen des ehemaligen "Starfish Café" in den Jahren 2011 und 2012

| **Facilities** | **2011** | **2012** |
|---|---|---|
| Sun beds | 22 | 27 |
| Wooden pavilions | 3 | 3 |
| Parasols | 13 | 7 |

Water sports activity

At Majesty Club Tuana, catamarans, paddleboats, surfboards, sails and kites, canoes, jet skis and speedboats were stored on the beach, some close to the water line and some directly at the water sports pavilion. At Lykia Botanika Beach & Fun Club, the small water sports center stored a few surfboards and one paddleboat. Both centers are operated by the same company, Detay Water Sports & Diving Center.

In order to pick up guests from both hotels, speedboats and jet skis frequently moved between the respective jetties. During daytime, between about 8 a.m. and sunset, they crossed between the jetties at high speed, typically very close to the beach and even inside the swimming zone, which is enclosed by buoys about 200 m offshore (Thake 2011).

Tab. 6: Number of water sport vehicles (shared between Majesty Club Tuana and Lykia Botanika Beach & Fun Club) in the years 2005-2012 (* no records)
Tab. 6: Anzahl von Wassersportgeräten (von Majesty Club Tuana und Lykia Botanika Beach & Fun Club verwendet) in den Jahren 2005-2012 (* keine Daten)

| **Vehicles** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
|---|---|---|---|---|---|---|---|---|
| Paddleboats | 2 | 2 | * | 4 | 4 | * | * | * |
| Canoes | 11 | 7 | * | 8 | 12 | * | * | * |
| Sailing boats | 1 | 2 | * | 2 | 2 | * | * | 3 |
| Motorboats | 3 | 4 | 6 | 6 | 9 | 9 | 9 | 9 |
| Jet skis | 0 | 0 | 6 | 0 | 7 | * | 5 | * |

Litter

Like in previous years, lots of rubbish was found all over the beaches. Much litter, e.g. food scraps, plastic plates and cups, bottles, plastic cutlery, bags, newspapers, tissues, blankets etc., was left by locals and tourists who visited the beaches for picnics and barbeques, particularly in the "picnic area" (Fig. 13). Lots of rubbish was also washed on the beach. Along both beaches, large amounts of marine debris, e.g. plastic containers, packaging material, fishing equipment, clothing, glass and metal items and cartons were deposited along with organic flotsam.

On a few occasions, leftovers of barbeques and campfires, some still burning, were found on the beach. People were observed camping and lighting fires very close to hatching nests (Fig. 14).

DISCUSSION

In 2012, Yaniklar and Akgöl beaches faced the same problems as in the previous years. Tourism remains one of the biggest threats to the successful nesting and hatching procedure of the loggerhead turtle.

The impact of tourism on successful nesting is illustrated impressively by the case of Small Beach, which did not feature a single nest this year. Until last year, nests were always found there, but this summer the female turtles may have been frightened off by the unusually large numbers of tourists using the beach (compare Fig. 15 (2012) with Fig. 16 (2011)). For that reason SEPA directives forbid access to the beach between 8 p.m. and 8 a.m. in order to protect nesting females (Information board 2012; Fig.). Furthermore, excavation work was done by heavy machines at the Small Beach in summer 2011 (Wiemers 2011), which might have altered the quality of the substrate and made sea turtle nesting difficult.

In addition to unsuitable substrate, the female turtles may find the access to the beach blocked by rows of sunbeds or other obstacles and turn back to the sea without having laid their eggs. In Yaniklar and Akgöl, 439 sunbeds were counted in total, in 2011 there were 391 (sunbeds at "Caretta Beach Bar" are not included because of missing data). Majesty Club Tuana set up 31 sunbeds less than last year but lined them up in four rows instead of two. There were new wooden boardwalks leading to the jetty and the hotel area and in front of the first row of sunbeds on one side, even though the old ones had only been disposed of in 2011 (Wiemers 2011). Covering of the beach with boardwalks, sunbeds etc. makes it impossible for female turtles to dig an egg chamber and is therefore a big problem. In the past, this has forced some turtles to dig nests even in the small space between the rows of sunbeds, e.g. on Çaliş beach (pers. comm., M. Stachowitsch). Therefore, the wooden boardwalks should be removed, in particular those parallel to the waterline.

Lykia Botanika Beach & Fun Club increased the number of sunbeds from 125 to 140 between 2011 and 2012. The position of the sunbeds was still too close to the water line, blocking the nesting zone. Fortunately, the wooden boardwalks that had been removed in 2010 were not replaced.

The lamps at Lykia Botanika Beach & Fun Club which are located close to the beach were were turned the wrong way, so that the blackened side of the lampshade did not face the beach. Another very bright light at the "Caretta Beach Bar" caused hatchlings from a nest nearby to move in the wrong direction. Sea turtle hatchlings orientate themselves primarily on the brightest horizon and are strongly drawn to artificial light sources, resulting in movement

towards roads, buildings, headlamps of vehicles etc. These lamps should therefore be removed, screened adequately or exchanged for yellow or orange lamps, which attract hatchlings less (Witherington & Bjorndal 1991). Lorne and Salmon (2007) found that after long misdirected crawling, hatchlings need some time to reorientate, i.e. a crawl of sufficient duration before reaching the sea (about 14 min after a misdirected crawl of 2 hours). Project members should keep this in mind when releasing hatchlings, especially because the turtles might return to the shore ten to fifteen minutes after having reached the sea "successfully" (Lorne & Salmon 2007).

Vehicles on the beach pose another major threat, not only because of the risk of running over a nest or hatchlings but also because of the tracks they leave behind (Lamont 2002). Once inside the track, the turtles cannot see the sea anymore and thus do not find right way. This year, hatchlings followed the truck tracks for up to 67 m before turning towards the sea. One nest was even run over by a heavy vehicle.

The ditches dug in order to prevent people from driving on the beach were only effective to some extent. Some drivers still entered the beach after filling the ditches up again, some used other entrances which were not blocked. Ensuring the absence of all vehicles from the beaches will require action by the Turkish authorities. Nevertheless, such ditches are a good means of protecting at least the nesting site at the end of Akgöl, provided that all entrances are blocked and the ditches are checked daily. This, however, is very labor-intensive and a more permanent solution should be sought, for example attractive wooden fences with gates for visitors on foot.

Like in the previous year, net fishing was observed very close to the beach, mainly in the early morning. Nets are potentially lethal for sea turtle hatchlings, in the water as well as on the beach, because they become entangled and drown or dehydrate and die in the heat (Triessnig et al., 2012). Also, adult females approaching the beach can get caught in the nets or swallow hooks. Fishing activity should therefore be banned effectively during the nesting and hatching season of *Caretta caretta*.

Apart from the endangering them through hooks and nets, fishing boats can collide with adult turtles and injure them. Dead loggerhead turtles with lethal wounds on carapaces, skulls or other body parts are washed on the beaches of Fethiye every (this volume, chapter X, Danz 2009, Burtscher & Eibenberger 2010, Petschinger 2011) . The activity of water sport centers like the ones in Akgöl and Yaniklar must therefore be controlled more strictly. Boat traffic should be banned within a certain distance from the beach during daytime and no boats at all should be allowed along the nesting beaches during the night.

For the effective realization of such measures and of official regulations, it is very important to inform the public. Many tourists are not informed about sea turtles and most do not know that Yaniklar and Akgöl are nesting beaches of *Caretta caretta*. At Lykia Botanika Beach & Fun Club, there was an information board next to the path leading to the beach. Apart from general information about sea turtles, guests get to read about "turtle-friendly" behavior and things to keep in mind when using a sea-turtle nesting-beach. Boards like this should definitely be erected at all entrances to the beaches, especially at the parking lot at the end of Akgöl beach and at the "picnic area", where many people enter. Of course, the boards should then be maintained and renewed regularly, ideally by the Turkish SEPA-authorities. This would be the best way to avoid damage to nests by vehicles and littering, which is a major problem not only for turtles but for all organisms.

Overall, the general condition of Yaniklar and Akgöl beaches in 2012 seems to be very similar to that of the previous years. Keeping in mind that Fethiye beaches are part of a Special Environmental Protection Area, there are still many problems to be solved. These problems are becoming increasingly urgent every year as the Mediterranean population of *Caretta caretta* declines. Every intact nesting beach must be conserved by all means in order to save the loggerhead sea turtle from extinction.

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APPENDIX


Fig. 1a: Aerial view of Akgöl beach (2012; google.maps.com)
Abb. 1a: Luftbild des Strands Akgöl (2012)


Fig. 2b: Aerial view of the northern end of Yaniklar beach (2012; google.maps.com)
Abb. 1b: Luftbild des nördlichen Strandendes vom Yaniklar (2012)

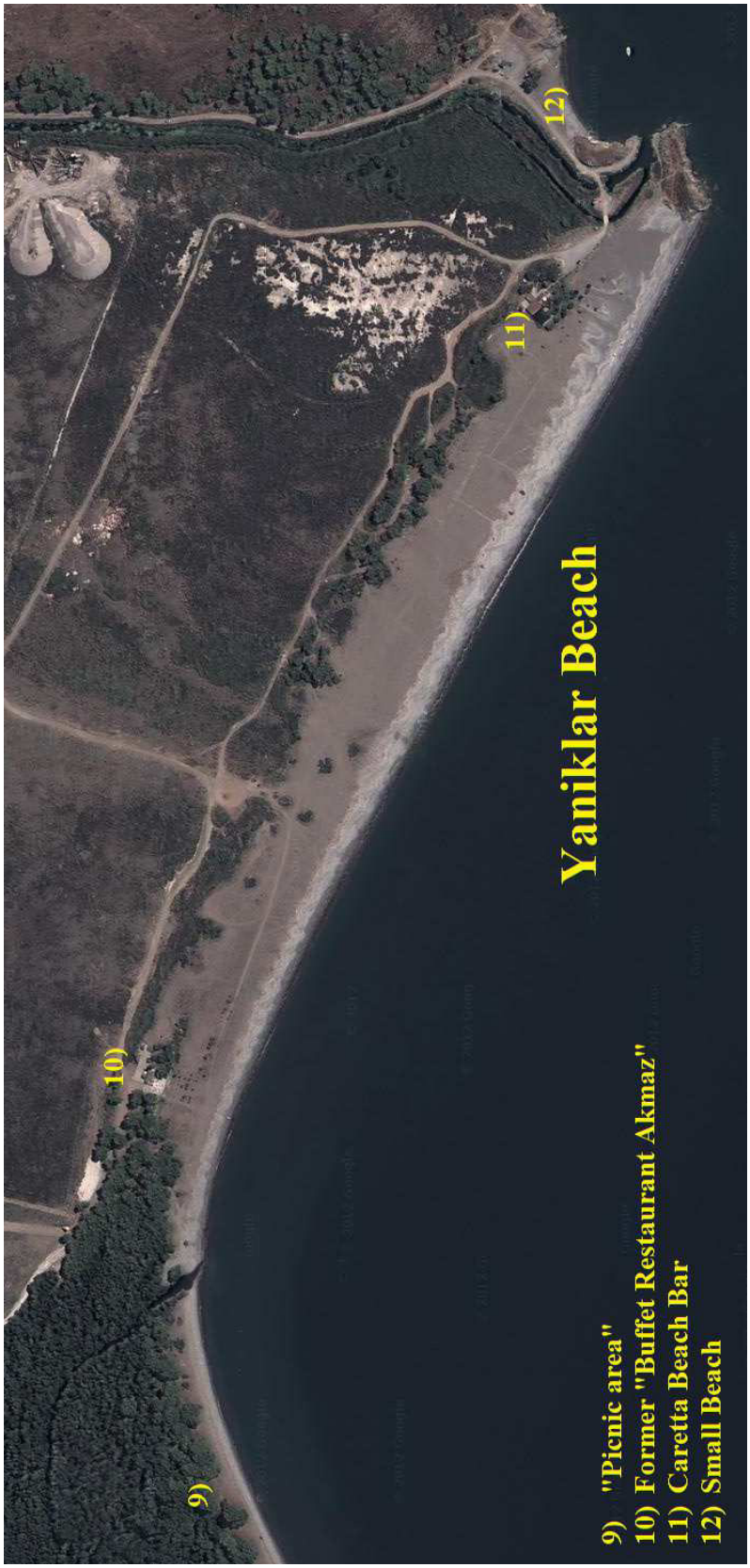

Fig. 3c: Aerial view of the southern end of Yaniklar beach and Small Beach direction Çaliş Beach (2012; google.maps.com)
Abb. 1c: Luftbild vom südlichen Strandende vom Strand Yaniklar und Small Beach Richtung Çaliş Beach (2012)

Fig. 2: Predatory crab of the family Ocypodidae (2012; Photo: D. Bernolle)
Abb. 2: Räuberische Krabbe der Familie Ocypodidae (2012)

Fig. 3a: End of Akgöl beach with wooden stakes (2011; Photo: M. Stachowitsch)
Abb. 3a: Ende des Strandes von Akgöl mit Holzpflöcken (2011)

Fig. 3b: End of Akgöl beach without stakes or ditches (2012; Photo: U. Pilwax)
Abb. 3b: Ende des Strandes von Akgöl ohne Pflöcke oder Gräben (2012)

Fig. 3c: Digging ditches at the end of Akgöl beach (2012; Photo: C. Fellhofer)
Abb.3c: Gräben werden am Ende des Strandes von Akgöl gegraben (2012)

Fig. 4: Damaged information board on Akgöl beach, the panels were found lying on the ground (2012; Photo: C. Fellhofer)
Abb. 4: Beschädigte Informationstafel am Strand von Akgöl, die Platten wurden am Boden liegend vorgefunden (2012)


Fig. 5: Lamp with blackened screen facing the wrong way, Lykia Botanika Beach & Fun Club (2012, Photo: M. Stachowitsch)
Abb. 5: Lampe mit abgedunkeltem Schirm in der falschen Position, Lykia Botanika Beach & Fun Club (2012)

Fig. 6: Nest run over by a large vehicle (2012; Photo: M. Stachowitsch)
Abb. 6: Von einem schwerem Fahrzeug überfahrenes Nest (2012)


Fig. 7: Hatchling tracks along vehicle tracks (2012; Photo: A. Kristic)
Abb. 7: Spuren von Schlüpflingen in Autospuren (2012)

Fig. 8a: Beach area of Majesty Club Tuana; note that beach facilities have been shifted landward (2012; Photo: M. Stachowitsch)
Abb. 8a: Strandbereich des Majesty Club; Strandeinrichtung wurde weiter Landeinwärts verrückt (2012)

Fig. 8b: Beach area of Majesty Club Tuana (2011; Photo: M. Stachowitsch)
Abb. 8b: Strandbereich des Majesty Club Tuana (2011)

Fig. 8c: Boardwalk at Majesty Club Tuana, leading to pier (2012; Photo: M. Lambropoulos)
Abb. 8c: Holzsteg bei Majesty Club Tuana (2012)

Fig. 9: Beach area of Lykia Botanika Beach & Fun Club; boardwalk between sun pavilions removed 2010 (sea turtle friendly) and not replaced (2012; Photo. M. Stachowitsch)
Abb. 9: Strandbereich des Lykia Botanika Beach & Fun Club (2012)

Fig. 10a: Beach area of Onur Camp, with sun pavilion (2012; Photo: M. Stachowitsch)
Abb. 10a: Strandbereich von Onur Camp, mit Sonnenpavillion (2012)

Fig. 10b: Beach area of Onur Camp without sun pavilion (2012; Photo: M.Stachowitch)
Abb. 10b: Strandbereich von Onur Camp ohne Sonnenpavillion (2012)

Fig. 11: Beach area of Yonca Lodge; sunbeds at landward end of beach and outside nesting zone (2012; Photo: M. Stachowitsch)
Abb. 11: Strandbereich der Yonca Lodge (2012)

Fig. 12a: Beach facilities at "Buffet Restaurant Akmaz" (2011, Photo: M. Stachowitsch)
Abb. 12a: Strandeinrichtungen bei „Buffet Restaurant Akmaz
(2011, Photo: M.Stachowitsch)

Fig. 12b: Beach facilities at "Buffet Restaurant Akmaz" (2012, Photo: M. Stachowitsch)
Abb. 12b: Strandeinrichtungen bei "Buffet Restaurant Akmaz" (2012)

Fig. 12c: "Buffet Restaurant Akmaz"; shower in nesting zone (2012; Photo: M. Stachowitsch)
Abb. 12c: "Buffet Restaurant Akmaz" (2012)

Fig. 13: Burned litter on the beach (2012; Photo: M. Lambropoulos)
Abb. 13: Müll am Strand (2012)

Fig. 14: Remains of a campfire with hatchlings tracks around it
(2012; Photo: C. Fellhofer)
Abb. 14: Reste eines Lagerfeuers mit Spuren von Schlüpflingen rundum (2012)

Fig. 15: Tourists and cars on Small Beach (2012; Photo: C. Fellhofer)
Abb. 15: Touristen und Autos am Small Beach (2012)

Fig. 16: Small Beach 2011 (2011; Photo: C. Fellhofer)
Abb.16: SmallBeach 2011 ( (2011)

# Hatcheries of the last 15 years in Çalış, Yaniklar and Akgöl: Success or loss?

Gerald Gimpl

KURZFASSUNG

In den letzten 15 Jahren wurden im Rahmen des Meeresschildkröten-Projektpraktikums Nester von der Unechten Karettschildkröte (*Caretta caretta*) verlegt. Diese Nestverlegungen (Hatcheries) werden bei Nestern durchgeführt, bei denen aus verschiedenen Gründen anzunehmen war, dass es zu keinem Schlüpf-Erfolg der *Caretta caretta* Schlüpflinge kommen wird. Zu den Beweggründen der durchgeführten Hatcheries zählte zum größten Teil die zu geringe Distanz des Nestes zum Meer.

Insgesamt wurden im Jahr 2012 zwei Hatcheries durchgeführt, die jedoch keinen Schlüpferfolg zeigten, die Embryonen starben in einem frühen Entwicklungsstadien bereits in den Eiern ab. Beide Nestverlegungen erfolgten in Akgöl. Nicht schlüpfende Hatcheries sind verglichen mit den vorhandenen Daten der letzten Jahre eine Ausnahme. 66, 3% aller Eier sind erfolgreich geschlüpft, 25,8% waren tote Embryos und 6,7% waren unbefruchtet.

Weiters wird in diesem Kapitel auch auf die Gründe des Schlupferfolges und auf das Risiko einer Nesterverlegung eingegangen und diskutiert ob es sinnvoll ist auch in Zukunft Hatcheries durchzuführen. Dazu werden Daten der letzten 15 Jahre verwendet, die von der Universität Wien und den türkischen Partneruniversitäten bei den durchgeführten Hatcheries von 20 Nestern mit insgesamt 1300 Eiern aufgenommen wurden.

ABSTRACT

This contribution deals with the success of hatcheries of *Caretta caretta* nests within the sea turtle field course in Fethiye in the last 15 years. Hatcheries are done when the risk that the clutches of *Caretta caretta* won't hatch is too high. The most frequent reason is the small distance from the nest to the sea. All in all, there were two hatcheries in 2012; neither was successful, only dead embryos in an early embryonic stage were found in the eggs. Both hatcheries were done in Akgöl. Such a complete failure is exceptional when comparing the data from the last years. 66.3% of all eggs were successful, 25.8% were dead embryos and 6.7% were unfertilized.

Furthermore, this chapter discusses the reasons for a successful hatching, the risk of a hatchery and the reasonableness for this strategy in the future. The analysis of 20 nests, in

total 1300 eggs, is based on data from hatcheries made over 15 years by the University of Vienna and Turkish partner universities.

## INTRODUCTION

Of seven species of sea turtles in the world, two nest in the Mediterranean: the green turtle (*Chelonia mydas*) and the loggerhead (*Caretta caretta*). Occasionally, the huge leatherback (*Dermochelys coriacea*) is reported in the waters of the Mediterranean.

Fethiye is one of 22 key nesting beaches of *Caretta caretta* in Turkey (Margaritoulis et al. 2003). Severe damage to the beaches is occurring despite the fact that the region is a Special Environment Protected Area (Council of Ministers' Decision 88/13019, 12.06.1988). Threats to the nesting population have continuously been increasing since Baran & Kasparek's first assessment in 1988, resulting in serious nesting decline since 1993 (Türkozan, 2000; Türkozan, 2003; Oruç et al. 2003; Ilgaz et al. 2007). In spite of the drop in nesting (peak 191 nests in 1995, lowest value 58 in 2004) the average number of nests for 12 consecutive years still makes this beach a key nesting site in Turkey (8.8% of the nests laid annually) (Ilgaz et al 2007). Fethiye has three beach sections: Çalış (2.5 km), Yanıklar (4.5 km) and Akgöl (1 km). Wetlands behind the beaches have been bulldozed for the construction of huge hotel complexes, snack bars and cafes are situated directly on the nesting beaches, motorised water sport activities are offered in the bay, and wooden walkways on the sand along with dense rows of beach furniture which remain on the beach on a 24-hour basis have been installed. Strong lighting is used during the night and visitors freely roam the beaches until the early hours of the morning. Artificial plastic carpeting covers part of Çalış nesting beach and large stones have been placed to delineate this area. 800 acacia trees, an introduced species known for its extensive rooting, were densely planted along a 150-m stretch of Çalış beach. Quads and trucks pass freely through the beaches and there is car access to virtually every beach. Giant picnics occupy the beach especially during the weekends. The garbage problem is entirely unsolved, accompanied by sand moving and removal, and fishing occurs directly off all three of Fethiye's nesting beaches.

To transfer a turtle's nest (hatchery) is a controversial conservation method. Mostly, it is performed because an adverse position of a nest may cause an unsuccessful hatching.

Once a female Loggerhead Turtle has returned to the beach of her birth to lay her eggs, she must choose where on the beach to dig the nest. This is an important choice. For instance, the

eggs must be placed far enough from the tidal zone to avoid being eroded or excessively washed by high tides, which may be lethal to the developing embryos  At the same time, the eggs must not be placed so far from the ocean that the emerging hatchlings are at greater risk to land predators or are unable to find the sea due to visual obstructions The place where the eggs are deposited will determine the developmental microenvironment of the nest and can affect many characteristics of the hatchlings, including hatching and emergence success, sex ratio, fitness, and vulnerability (Bolten and Witherington 2003).

Doing a hatchery includes considering 3 major characteristics, namely (1) the characteristics of the sand, (2) other characteristics of the nesting site, and (3) the dimensions of the nesting cavity (Bolten and Witherington 2003).

## MATERIAL AND METHODS

For doing a successful hatchery, working accurately is very important. Before starting, one has to make sure to wear surgical gloves. First the eggs have to be removed, best by one person because it is necessary to put those eggs in the same way in the new nest as they were taken out from the old one (Fig.5, Fig.6). The dimensions of the nesting cavity influence characteristics of the hatchlings by influencing the incubation environment (Fig.8). Variations in the vertical dimensions of the egg chamber change the number of eggs that incubate at the periphery Loggerhead hatchlings from eggs that were at the center of clutches have been found to be larger and to be more active during the swimming frenzy period (Bolten & Witherington 2003).

Meanwhile, a new nesting egg chamber has to be dug such that the eggs are exposed for the shortest period possible. The new nest must have the same measurements as the old one. Variations in the vertical dimensions of the egg chamber change the depth at which eggs incubate. Variations in the horizontal dimensions of the chamber change the number of eggs that incubate in the center of the nest and the number that incubate at the periphery (Bolten & Witherington 2003).

Some of the sand that surrounds the original egg chamber should be transferred with the eggs because it contains the antibacterial mucus from the mother. In the absence of a developed immune response or maternal antibodies, a developing egg must rely on non-specific defences against microbial invasion. The cloacal mucus that covers the turtle egg at oviposition may prevent *Fusarium oxysporum*, *Fusarium solani* and *Pseudallescheria boydii* spores from germinating and potentially colonizing viable eggs. Cloacal mucus dries on the egg within

several days and it is unknown if the anti-pathogenic properties continue after this time. (Phillott & Parmenter 2012). To prevent the eggs from any other infections, wearing single-use surgical gloves is recommended and was done during our hatcheries.

The final part of a hatchery is putting the eggs in the new egg chamber. Besides the order of the eggs in the egg chamber, it is also very important to avoid needless movements of the egg. Moderate movement or rotation does not adversely affect eggs approximately in the first 12-24 hours after they are laid. After that time, moving the eggs may disrupt embryonic membranes, causing decreased hatching success (Bolton & Witherington 2003).

The distance to the sea was about 4.3 m, so it was very important to do a hatchery. The egg chamber was much too wet und the substrate was stony with pebbles up to 1 cm in diameter. The wet substrate was also very unstable: when we dug the eggs up, the egg chamber repeatedly collapsed. A few eggs were already destroyed, even at the bottom of the chamber, pointing to the importance of making a hatchery in this case. In this special case we discoverd that the eggs at bottom were already destroyed because we wanted to do the hatchery of the close distance to sea. We explained the destroyed eggs because of the corse substrate. In another case we wouldn't have looked at the bottom of the chamber. So we left the broken in the old nest and buried them.

RESULTS

In the last 15 years, from 1997 until 2012, 20 hatcheries had been done. Overall, 1300 eggs were transferred: 886 hatchlings reached the sea, 92 eggs were unfertilized, and 351 dead embryos in various states of development and 80 dead hatchlings were recorded. Table 1 gives an overview of the hatcheries. Looking at the 20 hatchery nests and their success, 8 of 19 nests released over 80% of their total number of eggs as hatchlings to the sea. Six of these 8 nests had 90% success, and 4 of these 6 nests hat over 95% success, which is very high.

Tab. 1: Registry of every hatchery done from 1997 to 2012. (n.d.: no data; h.r.t.s = hatchlings reaching the sea)
Tab.. 1: Auflistungen aller Hatcheries von 1997 bis 2012

| year | Nest -Nr. | Nest date | Hatchery -date | Incubation Time | Total nr. of eggs | h. r. t.s | unfert. Eggs | dead embryos | dead hatchlings | dist. To sea | Hn.d.dist. To sea |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1997** | C2 | 19.6. | 11.08. | 67 | 63 | 57 | 4 | 1 | 1 | n.d. | |
| | C10 | 19.7. | 11.08. | n.d. | n.d. | n.d. | 6 | 4 | n.d. | 9 | |
| **2000** | C15 | 11.07. | 11.7. | 46 | 52 | 52 | 0 | 0 | 0 | 3 | 12,7 |
| | Y23 | n.d. | n.d. | n.d. | 75 | 68 | 0 | 7 | 0 | n.d. | n.d. |
| | Y31 | n.d. | n.d. | n.d. | 105 | 91 | 0 | 14 | n.d. | n.d. | n.d. |
| **2001** | C9 | 05.07. | 5.7. | 58 | 88 | 35 | 0 | 53 | 0 | 14,2 | 19 |
| | C11 | 15.07. | 15.7. | 46 | 89 | 34 | 0 | 62 | 0 | 13,1 | 16,5 |
| | Y20 | 23.6. | 24.6. | 57 | 85 | 79 | 1 | 2 | 3 | 11,3 | 11,6 |
| | Y24 | 27.6. | 27.06. | 54 | 93 | 91 | 0 | 2 | 0 | 35 | 26,2 |
| | Y30 | 29.6. | 29.06. | 54 | n.d. | 65 | n.d. | n.d. | 0 | 26,2 | 15 |
| | Y35 | 2.7. | 2.7. | 49 | 85 | 60 | 0 | 25 | 0 | 10,2 | 26,2 |
| **2003** | C1 | 21.06. | 21.6. | 48 | 91 | 87 | 0 | 4 | 0 | 1,7 | 17,3 |
| **2004** | C16 | 6.7. | 6.7. | n.d. | 64 | 0 | 0 | 0 | 64 | n.d. | n.d. |
| **2006** | C6 | 21.06. | 21.06. | 51 | 77 | 64 | 5 | 2 | 1 | n.d. | 14,1 |
| **2007** | C10 | 15.07. | 15.07. | 45 | 76 | 44 | 5 | 4 | 10 | 7,3 | 18,7 |
| | C11 | 15.07. | 15.07. | 51 | 53 | 0 | 45 | 7 | 0 | 27,8 | 27,3 |
| | C13 | 24.07. | 24.7. | 46 | 51 | 19 | 11 | 3 | 0 | 29,3 | 18,6 |
| **2009** | 1 Calis | 09.07. | 09.07. | 46 | 67 | 40 | 13 | 14 | 1 | 4,76 | 14,4 |
| **2012** | A7 | 11.07. | n.d. | n.d. | 84 | 0 | 2 | 82 | 0 | 8,3 | 19,4 |
| | A8 | 14.07. | n.d. | n.d. | 65 | 0 | 0 | 65 | 0 | 4,3 | 11,1 |
| **Total** | | | | | **1300** | **886** | **92** | **351** | **80** | **205,46** | **268,1** |

Most of those nests were transferred because they were too close to the sea, except for Y20, Y24, Y35 and C11. Y20 (2001) was laid too near to a street, Y24 (2001) was laid in stony soil, Y35 (2001) was too close to a sand excavation site, so there was a possibility of hatchlings falling into this pit and being unable to escape. C11 (2007) was situated in the permanent shadow of a bush and in a stony underground.

Two of those 20 nests, A7 and A8 in 2012, were not successful because not a single turtle hatched. C16 (in 2004) wasn't successful either, but based on other criteria: the hatching success was 100% but none of the hatchlings reached the sea.

To reconstruct how we did the hatcheries in 2012, here is a short summary: The two nests, A7 and A8, which were translocated this year, were both situated in Akgöl beach. A7 was located at the end of the beach where fine sand is the dominant substrate. The rest of the beach consists of sand mixed with pebbles and cobbles. A7 was found in the morning shift, 09.07.2012, about 7 o'clock. The distance to the sea was 8.3 m. We did the hatchery on the same day because the distance was too close and the hatching success of loggerhead clutches decreases when sand water content is too high (Bolten & Witherington 2003). We did the hatchery in the evening (about 6:30 pm) because this part of Akgöl beach is highly frequented by locals during the day, which may disturb the work.

For a meaningful comparison, one approach is to compare the total success of hatchery nests and the overall hatching success of non-hatchery nests over the last 3 years.

In the 2011 nesting season, a total of 5006 eggs were laid. From this total, 3103 hatchlings developed and were documented as having reached the sea (62%). 417 eggs (8.3% of all laid eggs) were documented as not fully developed (early-, mid- or late-embryonic stage) and 752 eggs (15% of all laid eggs) as unfertilized. The remaining 690 eggs hatched, but the hatchlings were reported as dead (13.8%) (Fig.1) (A.Buck, P.Steiner,B.Glasl, M. Morhart 2011) (Fig. 1-3).

In the 2010 nesting season, a total of 7090 eggs were laid. From this total, 5063 hatchlings developed and were documented as having reached the sea (72.2%). 546 eggs (7.7% of all laid eggs) were documented as not fully developed (early-, mid- or late-embryonic stage) and 984 eggs (11.5% of all laid eggs) as unfertilized. The remaining 497 eggs hatched, but the hatchlings were reported as dead (7%) (Fig.1-3) (L. Sommer, K. Baron S. Amon, A. Dünser 2010).

In the 2009 nesting season, a total of 7096 eggs were laid. Of these, 5291 hatchlings developed and were documented as having reached the sea (74.6%). 547 eggs (7.7% of all laid eggs) were documented as not fully developed (early-, mid- or late-embryonic stage) and 983 eggs (13.9% of all laid eggs) as unfertilized. The remaining 275 eggs hatched, but the hatchlings were reported as dead (3.9%) (C.P. Kruspe, N.Steurer, B. Sonnleitner, C.westernberg 2009) (Fig. 1-3).

Combining all the hatchery data of 15 years and calculating them as percentages yields a total of 1300 eggs. Of the 1300 eggs, 886 hatchlings developed and were documented as having reached the sea (68%). 351 eggs (27% of all laid eggs) were documented as not fully developed (early-, mid- or late-embryonic stage) and 92 eggs (7% of all laid eggs) as unfertilized. 80 eggs hatched but the hatchling were reported as dead (6.2%) (Fig.1-3).

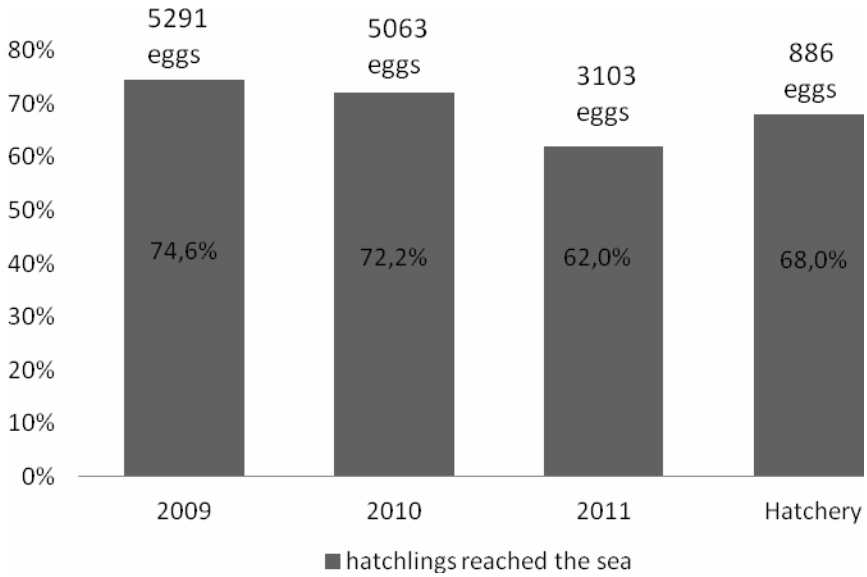


Fig. 1 Difference between hatchlings reaching the sea in the years 2009, 2010, 2011 (all nests) and from the hatcheries 1993-2012
Abb. 1 Unterschiede des Nisterfolgs der Jahre 2009, 2010, 2011 und der Hatcheries von 1993-2012 von Hatchlingen die in das Meer gelangt sind

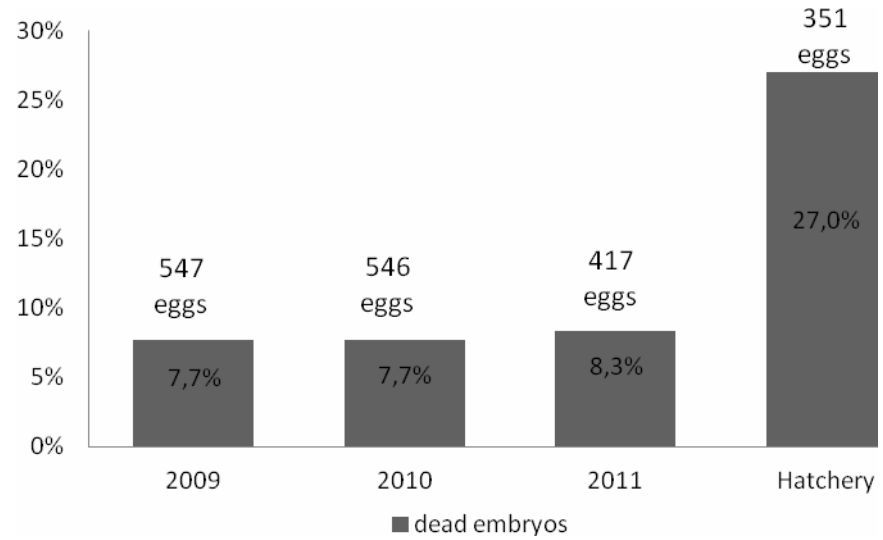


Fig. 2: Difference between embryo mortality in the years 2009, 2010, 2011 (all nests) and from the hatcheries
Abb. 2: Unterschiede zwischen der Embryosterblichkeit im Jahr 2009, 2010, 2011 and von den Hatcheries

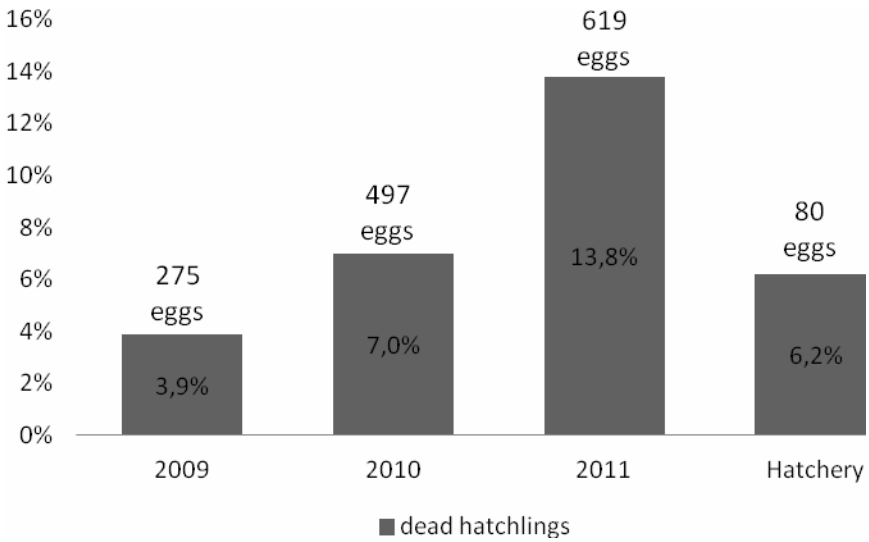


Fig. 3: Difference between hatchling mortality in the years 2009, 2010, 2011 (all nests) and from the hatcheries
Abb.3: Unterschiede bei der Hatchlingsterblichkeit in den Jahren 2009, 2010, 2011 und von den Hatcheries

## DISCUSSION

Deciding to do a hatchery depends on many factors and it is not always clear if a nest is too close to the waterline or to a street or if it is possible that the nest would survive without human interference. One major general issue is the potential risk of disturbing the natural process of development and growth and thus reducing the chances for the eggs to succeed. The most important thing is that the hatchery is done within 12-14 hafter the eggs were laid.. Assuming that the adult females laid their nests between 10 p.m. and 2 a.m., which is the most common nesting time in Yaniklar, Akgöl and Calis, the hatcheries – performed in the late afternoon of following day, were done in the second half of this timeframe. Miller (1985), however, claims that once an egg is oviposited, development resumes within a few hours (4-8 h, depending on the temperature). Rough handling (movement involving rotation and/or jarring) of the eggs after development resumes causes rupturing of delicate membranes and kills the embryo.

Human-related activities performed solely to promote the recovery of loggerheads can also alter incubation environments (Bolten & Witherington 2003). Nest relocation can substantially change the incubation environment and the characteristics of hatchlings Even if a clutch is relocated to a site with characteristics that are apparently identical to the original

site, the incubation environment can still be altered if the depth and shape of the new egg chamber does not match that of the original nest (Bolten & Witherington 2003).

No comparison between the nest depths and diameters of original nest cavities and "artificial"ones were done here because the data were often missing.

Note also that a female adult loggerhead is guided by instinct when choosing a nesting place. It may be inappropriate for humans to second-guess this process. Anthropogenic influences often reduce the variety of incubation environments. If the remaining incubation environments are unsuitable for egg development, then the clutches will fail. Because the characteristics of hatchlings vary with incubation environments, a scattered nesting pattern also increases the variation of hatchling characteristics. This may ensure that at all times at least some hatchlings have characteristics that are appropriate for survival, when the exact characteristics that are best suited for survival vary unpredictably over spare and time (Bolten & Witherington 2003). Human-related activities that reduce the variety of incubation environments reduce the variety of hatchling characteristics that are produced. If the specific characteristics produced by the limited incubation environments do not enhance survival, then the overall survival rate of hatchlings may be less than it would have been if the full spectrum of incubation environments and, consequently, the full spectrum of hatchling characteristics had been maintained (Bolten & Witherington 2003). Accordingly, a hatchery should be a last conservation method and be done solely when it is absolutely clear that the clutch would die otherwise.

Examining the data collected over the last 15 years reveals that relocating a clutch can be effective. During this period, only 2 nests were complete failures (both 2012); an additional nest (in 2004) hatched but none of the hatchlings survived, but this was not be the fault of the hatchery because they all hatched but none of them got out of their nest

Comparing relocated nests and unchanged the ones, percentage of hatchlings reaching the sea is not significant lower than in past years (Fig. 2). The hatchery value is even higher than the overall percentage in 2011. Over the last 15 years, there was also 1 nest, C15 in 2000, where 100% emerged and reached the sea, which is a very positive example for a hatchery. Combined counts of eggshell remnants and unhatched eggs (opened to determine if any development had occurred) indicate fertility is typically greater than 80% (Blank and Sawyer 1981). As a general rule, emergence success (reaching the beach surface) is slightly lower than hatching success because not all hatchlings that struggle out of their eggshells actually make the climb to the beach surface (Miller 1985).

Examining the overall embryo mortality (Fig. 3) in the years 2009, 2010 and 2011 reveals similar values each year. The hatchling mortality in hatcheries, however, is much higher. This parameter might better reflect the consequences of a hatchery. This again raises the question whether potentially higher embryo mortality is justifiable or whether it would be better for the nest and for the diversity of the overall population if the nest is kept undisturbed. If the nest is too close to the waterline and the risk of flooding the whole nest is too high, a hatchery is nonetheless recommended. In the case of other nest positions, such as clutches in the shadow of vegetation, a hatchery has to be well considered from case to case because every disturbance is a risk to decrease the success of a nest.

Comparing the dead hatchlings from all nests in 2009, 2010, and 2011 and from the hatcheries (Fig. 4), there is no big difference. This provides good evidence that a hatchery does not exert a major influence the fitness of the hatchlings.

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APPENDIX

Fig. 4: A dug out nest
Abb. 4: Ein ausgegrabenes Nest

Fig. 5: Digging out the A8 nest for a hatchery
Abb. 5: beim Ausgraben des A8 Nest für eine Hatchery

Fig. 6: getting the eggs out the A7 nest
Abb. 6: Herausnehmen der Eier aus dem A7 Nest


Fig. 7: A bucket full of eggs
Abb. 7: Ein Kübel voller Eier

Fig. 8: Measurement of the new egg chamber
Abb. 8: Abmessen der neuen Eikammer

Fig. 9: Eggs in a new Nest
Abb. 9 : Eier in einem neuen Nest

Fig. 10: Putting the eggs in a new Nest
Abb. 10: Die Eier wurden in ein neues Nest gelegt

Fig. 11: New Measurement of the distance to the sea after a hatchery
Abb. 11: Neue Abmessung des Abstandes zum Meer nach einer Hatchery

# DEKAMER Sea Turtle Research, Rescue and Rehabilitation Center, Dalyan, Turkey

Judith Ullmann

KURZFASSUNG

Rettungsstationen für Meeresschildkröten leisten einen bedeutenden Beitrag zum Artenschutz. Im Jahr 2004 hat das Regionale Aktivitätszentrum für besondere Naturschutzgebiete (RAC/SPA) einen Verhaltenskodex für Rettungsinstitutionen im Mittelmeerraum erarbeitet. Eine Vielzahl an Meeresschildkröten wird durch Zusammenstöße mit Booten verletzt oder endet als Beifang in der Fischerei. Fischereiaktivitäten finden größtenteils in Schildkrötenhabitaten nahe der Küste statt. Im östlichen Mittelmeerraum sind die entsprechenden Einrichtungen gering an der Zahl. DEKAMER wurde 2008 in Dalyan gegründet. Es ist bis heute das einzige Rettungszentrum speziell für Meeresschildkröten in der Türkei. Die Ziele der Organisation sind: Schutz des Niststrandes in Dalyan, genetische und entwicklungsbiologische Untersuchungen, Rettung verletzter Schildkröten aus türkischen Gewässern, Tagging-Programme und Öffentlichkeitsarbeit. Der folgende Bericht über DEKAMER basiert auf Informationen, die vor Ort im Juli 2012 erhoben wurden.

ABSTRACT

Sea turtle rescue centers are considered an important conservation instrument. In 2004 the Regional Activity Center for Specially Protected Areas (RAC/SPA) decided on a code of conduct for Mediterranean rescue institutions. Most sea turtles' injuries are caused by collision with watercraft and capture in fishing gear. Major fishing activity takes place in sea turtle habitats close to the coast. In the Eastern Mediterranean there is a pronounced shortage of rescue facilities. DEKAMER was founded in Dalyan in 2008. It is Turkey's only sea turtle rescue center to date. Its objectives are the protection of Dalyan's nesting beach, research on genetics and development, the rescue of injured turtles from all over Turkey, tagging programs, and raising public awareness. The following report on DEKAMER is based on information obtained on site in July 2012.

INTRODUCTION

Rescue centers are considered an important instrument in reducing sea turtle mortality. In 2004 the Regional Activity Center for Specially Protected Areas (RAC/SPA) first suggested and defined guidelines of conduct for sea turtle rescue organizations in the Mediterranean (RAC/SPA 2004). The aim was to regulate and standardize rescue centers' activities with respect to sea turtle biology and established principles of conservation. The guidelines should also serve as a base for national legislation on rescue facilities. Rules and regulations had become necessary, as a number of newly founded rescue centers had failed to provide adequate technical facilities and/or specialized personnel. Their code of conduct was questionable in regard to established ethical and scientific principles.

To avoid adverse effects on the animals' health, sea turtle rescue centers should:

- Respect the common guidelines
- Act solely for the well-being and protection of the animals
- Hold current permits from the proper authorities and undergo periodic inspections
- Be fully supported by public or private funding
- Have specific scientific competence
- Hold periodic training sessions (RAC/SPA 2004).

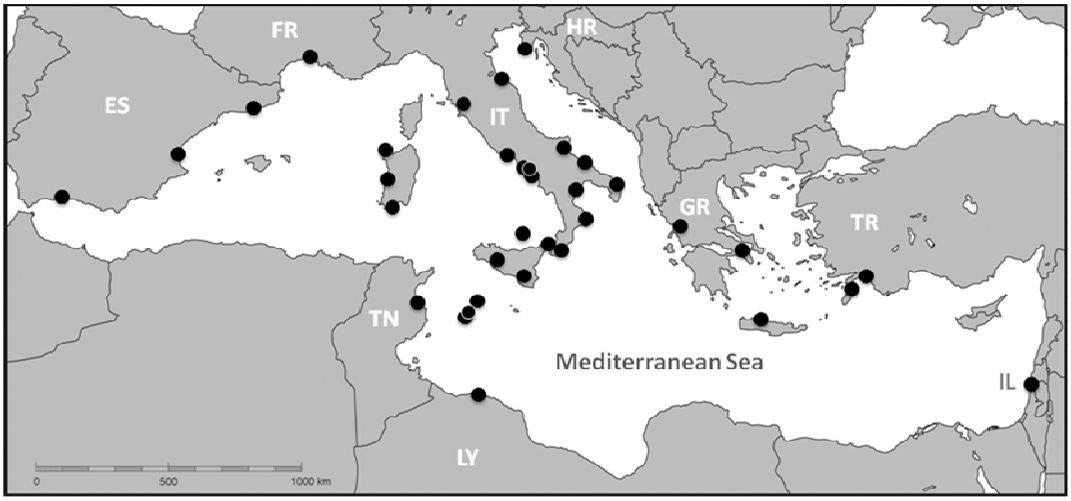


Fig. 1 Sea turtle rescue centers in the Mediterranean. The term rescue center refers to rescue centers and first aid stations/ emergency centers alike. Asterisk: location of DEKAMER. Complete list of depicted centers is contained in the appendix. ES, Spain; FR, France; GR, Greece; HR, Croatia; IL, Israel; IT, Italy; LY, Libya; TN, Tunisia; TR, Turkey. Based on available internet data; latest update: 5 Sept 2012.
Abb. 1 Meeresschildkröten-Rettungsstationen im Mittelmeer inklusive Erste Hilfe Zentren. Asterisk: Lage von DEKAMER. Komplette Liste der abgebildeten Stationen siehe Appendix. ES, Spanien; FR, Frankreich; GR, Griechenland; HR, Kroatien; IL, Israel; IT, Italien; LY, Libyen; TN, Tunesien; TR, Türkei. Basierend auf Internet-Daten, letzter Stand 5.9.2012.

Most injuries inflicted on sea turtles are caused by collision with watercraft and accidental capture in fishing gear. Common problems are traumatic injuries, ingestion of fishing hooks and monofilaments, entanglement in fishing lines or nets, gastrointestinal obstruction, buoyancy disorders, emaciation, hypothermia, intoxication by petroleum products (RAC/SPA 2004). RAC/SPA proposed a rescue network in 2004, consisting of cooperating rescue centers, strategically based along the Mediterranean Coast. Each center would be affiliated to a number of emergency centers with basic first aid facilities (RAC/SPA 2004). At the time, about a dozen centers were in operation (Kasparek 2001; RAC/SPA 2004). Today there are more than 30 rescue institutions (Fig. 1, see also appendix), albeit most of them are located in the central and western Mediterranean. Sea turtle nesting sites, however, are located mainly in the eastern Mediterranean, next to major feeding grounds and overwintering areas (Lucchetti & Sala 2010; http://www.euroturtle.org/distrib.htm) (Fig. 2). Since most fishing activity takes place in shallow water along the coast (Lucchetti & Sala 2010) (Fig. 3), sea turtles are prone to accidents especially during the nesting season. In 2008, DEKAMER, the Sea Turtle Research, Rescue and Rehabilitation Center, was founded in Dalyan/Muğla, Turkey (**Fig. 1**). It is in close vicinity to one of Turkey's most important nesting beaches for Loggerhead Turtles (*Caretta caretta*).

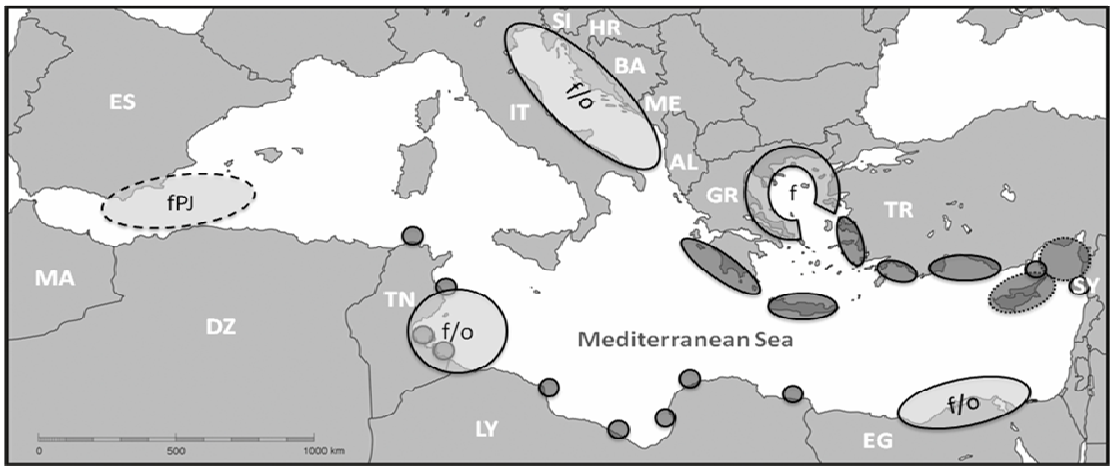


Fig. 2 Mediterranean areas frequented by marine turtles. Dark gray dots depict nesting sites of Loggerhead Turtles (solid outlines) and Green Turtles (dotted outlines). f, feeding ground; f/o, feeding ground/ overwintering area; fPJ, feeding ground of pelagic juveniles. AL, Albania; BA, Bosnia and Herzegovina, DZ, Algeria; EG, Egypt; ES, Spain; GR, Greece; HR, Croatia; IT, Italy; LY, Libya; MA, Morocco; ME, Montenegro; SI, Slovenia; SY, Syria; TN, Tunisia; TR, Turkey. Based on Lucchetti & Sala (2010) and http://www.euroturtle.org/distrib.htm.

Abb. 2 Mittelmeergebiete mit hoher Dichte an Meeresschildkröten. Nistgebiete der Unechten Karettschildkröte in dunkelgrau (Umriss durchgezogen) und der Grünen Meeresschildkröte in dunkelgrau (Umriss strichliert). f, Nahrungsgründe; f/o, Nahrungsgründe/ Überwinterungsgebiet; fPJ, Nahrungsgründe pelagischer Jungtiere. AL, Albanien; BA, Bosnien-Herzegowina, DZ, Algerien; EG, Ägypten; ES, Spanien; GR, Griechenland; HR, Kroatien; IT, Italien; LY, Libyen; MA, Marokko; ME, Montenegro; SI, Slowenien; SY, Syrien; TN, Tunesien; TR, Türkei. Basierend auf Lucchetti & Sala (2010) und http://www.euroturtle.org/distrib.htm.

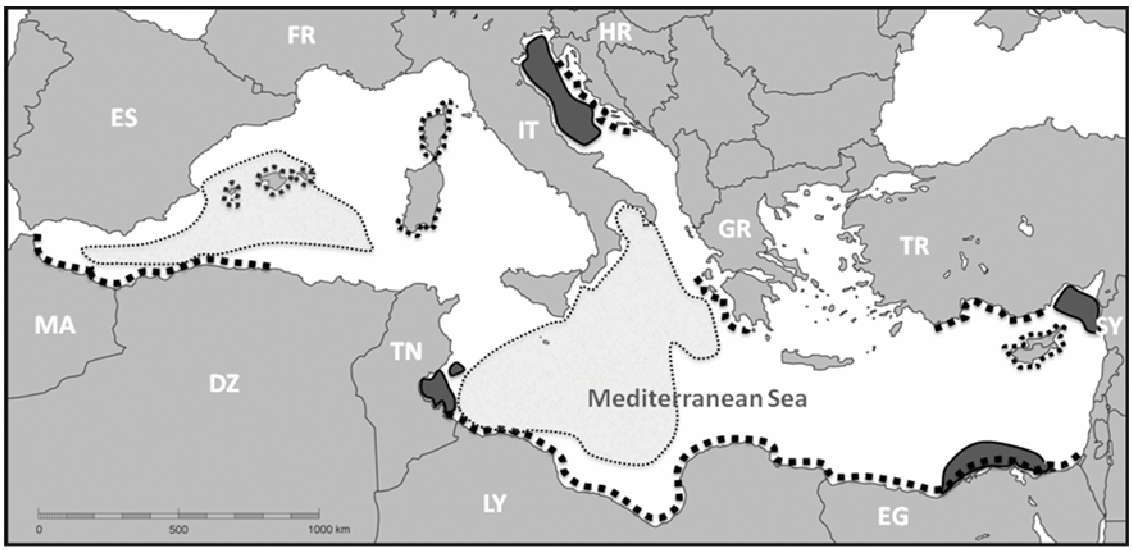


Fig. 3 Major fishing techniques in the Mediterranean Sea. Set net fishery in dotted lines, drifting longline fishery in light gray sections, trawling in dark gray sections. Note spatial correlation with sea turtle habitats in Fig. 2. DZ, Algeria; EG, Egypt; ES, Spain; FR, France; GR, Greece; HR, Croatia; IT, Italy; LY, Libya; MA, Morocco; SY, Syria; TN, Tunisia; TR, Turkey. After Lucchetti & Sala (2010).
Abb. 3 Hauptfischfangtechniken im Mittelmeer und deren Verbreitung. Stellnetzfischen strichliert, Fischen mit treibenden Langleinen in hellgrau, Schleppnetzfischen in dunkelgrau. Beachte räumliche Übereinstimmung mit Meeresschildkröten-Habitaten in Abb. 2. DZ, Algerien; EG, Ägypten; ES, Spanien; FR, Frankreich; GR, Griechenland; HR, Kroatien; IT, Italien; LY, Libyen; MA, Marokko; SY, Syrien; TN, Tunesien; TR, Türkei. Nach Lucchetti & Sala (2010).

REPORT

The following information was obtained on site during a personal interview with Meryem Tekin, research assistant at DEKAMER, on 23 July 2012. Additional information came from DEKAMER's official web page http://caretta.pau.edu.tr/ (latest update: 5 Sept 2012).

DEKAMER was founded by zoologist Dr. Yakup Kaska, professor at Pamukkale University, in 2008. It is located next to Dalyan Beach, one of the most important nesting beaches of Loggerhead Turtles (*Caretta caretta)* in south-west Turkey. DEKAMER is Turkey's only sea turtle rescue center to date and is open to the public year round. Its activities are financed by donations from the public and private funding. Major donors are The Baku-Tbilisi-Ceyhan Pipeline Company (BTC Co., part of BP Caspian) and the travel agency TUI AG. DEKAMER has about 30,000 visitors a year. Medical supplies come from Pamukkale University. Animal feed is bought at the Dalyan fish market or obtained through donations (M. Tekin, pers. comm.).

DEKAMER's main objectives are:

- Conservation and protection of Dalyan Beach
- Tagging nesting females
- Research on embryonic development, genetic variety, heavy metal contamination
- Rescue and rehabilitation of injured or stranded turtles from all over Turkey
- Satellite tracking released turtles
- Raising public awareness

(http://caretta.pau.edu.tr/project.html, http://caretta.pau.edu.tr/2011rapor.pdf).

DEKAMER's permanent staff consists of zoologists, biologists, and a veterinarian technician. Veterinarians of Pamukkale University and from rescue centers in the United States, Croatia, Spain, and Italy are consulted with, when necessary. Volunteers and students work as visitor guides and beach patrollers during the nesting season. They help in the keeping of the animals and in maintaining the facilities (M. Tekin, pers. comm.).

Injured turtles are brought in from all over the Turkish coast but the majority comes from Dalyan (40%) and Bodrum (13%) (http://caretta.pau.edu.tr/bilgitakipformu.pdf). An information network has been established: residents, fishermen and tourists can contact the center either directly or through official bodies (Coast guard, police, Ministry of Environment and Forestry) in case of emergency. Rescued animals are brought to Dalyan by car (property of Pamukkale University) or minibus (donation from BTC Co.), according to their size and numbers (M. Tekin, pers. comm.).

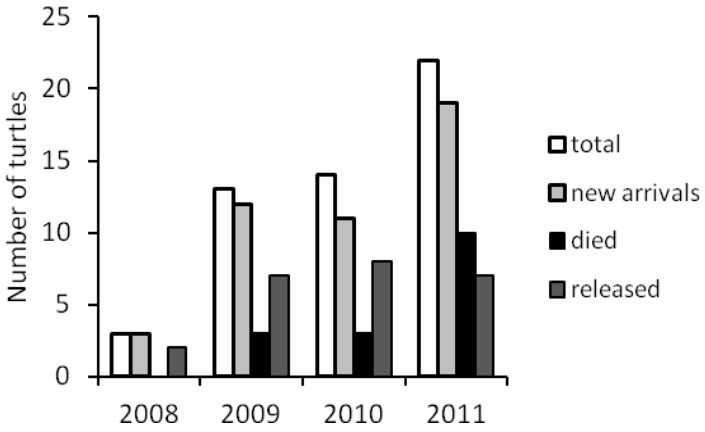


Fig. 4 Sea turtles treated at DEKAMER from 2008 through 2011 (N=45, n=43). Based on http://caretta.pau.edu.tr/bilgitakipformu.pdf.
Abb. 4 Meeresschildkröten in Behandlung bei DEKAMER von 2008 bis 2011 (N=45, n=43). Basierend auf http://caretta.pau.edu.tr/bilgitakipformu.pdf.

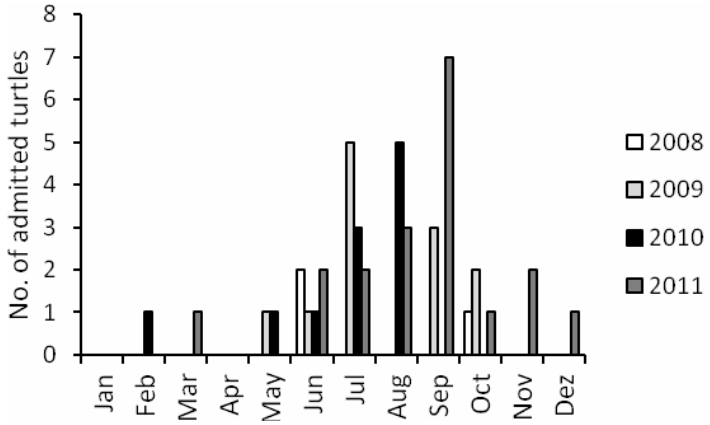


Fig. 5 Number of admissions to DEKAMER in the course of the year (N=45, n=43). Note peak of admissions during the summer months. Based on http://caretta.pau.edu.tr/bilgitakipformu.pdf.
Abb. 5 Zahl der von DEKAMER aufgenommenen Schildkröten im Jahresverlauf (N=45, n=43). Beachte Anstieg der Aufnahmen während der Sommermonate. Basierend auf http://caretta.pau.edu.tr/bilgitakipformu.pdf.

From 2008 through 2011, 45 cases had been treated, the number of patients growing continuously over the years (Fig. 4). Thirty-two Loggerhead Turtles (*Caretta caretta*), 10 Green Turtles (*Chelonia mydas*), and 1 African Softshell Turtle (*Trionyx triunguis*) had been under treatment (http://caretta.pau.edu.tr/bilgitakipformu.pdf). Two Loggerhead Turtles were admitted to the rescue center twice with a one-year break in between. Most turtles were admitted during the summer months (Fig. 5). Note that the number of injuries correlates with the nesting season and peak season in tourism, when human activities in the water are at their

highest. Most injuries were caused by ingestion of/entanglement in fishing gear and collisions with watercraft (Fig. 6). Ingested objects included fishing hooks, monofilament lines and a variety of plastic products, mostly plastic bags (M. Tekin, pers. comm.). Collisions with watercraft led mostly to fractures of the carapace and skull and/or propeller cuts. In 2011, four turtles were admitted to the center with buoyancy disorders (Fig. 6). These were likely to have been caused by collisions as well. Natural causes of injury or illness were an exception to the rule, e.g. parasitism (Fig. 6). Standard treatment took about one month in 2008, 2009, and 2011; in 2010, the period of therapy was twice as long (Fig. 7). 18% of all (2008-2011) individuals stayed less than one week at the center; half of the 18% had died two to three days after admission. The longest treatment took 743 days (http://caretta.pau.edu.tr/bilgitakipformu.pdf) (Fig. 7).

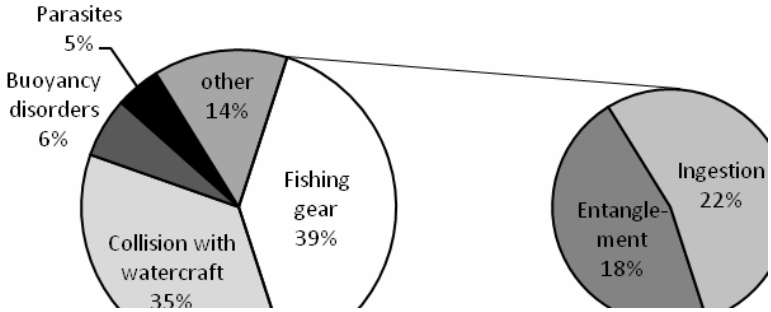


Fig. 6 Causes of injury and illnesses (N=65, n=43). Based on http://caretta.pau.edu.tr/bilgitakip formu.pdf.
Abb. 6 Verletzungsursachen und Krankheiten (N=65, n=43). Basierend auf http://caretta.pau.edu. tr/bilgitakipformu.pdf.

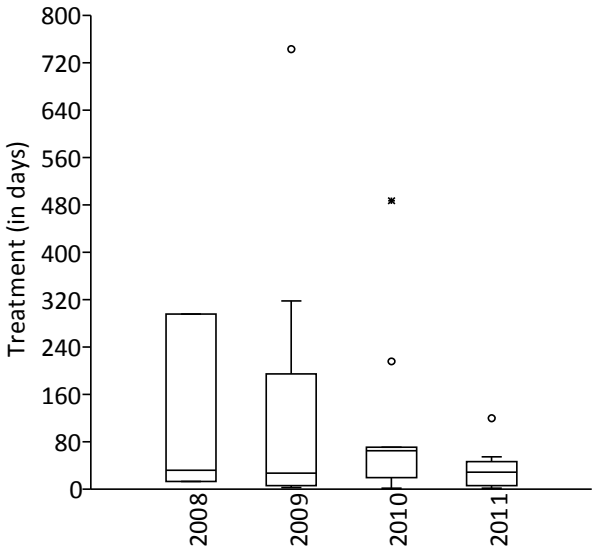


Fig. 7 Duration of therapy (N=45, n=43). Death cases included. Note outliers. Based on http://caretta.pau.edu.tr/bilgitakipformu.pdf.
Abb. 7 Behandlungsdauer (N=45, n=43). Todesfälle inkludiert. Beachte Ausreißer. Basierend auf http://caretta.pau.edu.tr/bilgitakipformu.pdf.

DEKAMER has 17 convalescence tanks in a semi-open system, ranging from about 400 L to 20,000 L (Figs 8-10). Adult turtles are kept in solitary tanks to keep stress levels low and prevent the transmission of infectious diseases. All tanks are in the open. Fixed roofs block the sun and help keep the animals from overheating (Figs 8-10). The turtles experience the natural day/night cycle and receive some sunlight, which is required for vitamin D production and which can speed up recovery (M. Tekin, pers. comm.).

Loggerhead Turtles are fed with frozen low-fat fish and crabs to account for the lack of exercise in their confined environment. Green Turtles receive frozen sea weed, which is collected by volunteers over the year. Smaller tanks are used for holding turtles while their swimming tanks are being drained and cleaned once a day. Emaciated turtles that can neither swim nor hold their heads up are held in small tanks without water to keep them from drowning. A wet cloth is draped over the carapace to keep it from drying out. Individuals that cannot eat by themselves are force-fed through a tube with fish purée made of sardines. This diet is high in fat and speeds up recovery (M. Tekin, pers. comm.).

Hatchlings that are found late in the morning on Dalyan Beach are kept in a small tank with water for a day or two (Fig. 11). It is DEKAMER's policy to withhold "late hatchlings" in order to protect them from diurnal predators and the sun's heat. They are set free at night (M. Tekin, pers. comm.). This is a controversial practice due to the hatchlings' loss of energy while swimming in a tank, i.e. the frenzy phase of swimming, which normally brings the hatchlings out to sea and away from nearshore predators (Pereira et al. 2011), may be compromised. Moreover, the imprinting process – when a hatchling memorizes its natal beach in order to return decades later for nesting – might be interfered with as well.

BTC Co. and TUI Nederland donated two 4-m-deep pre-release tanks this year (Fig. 10). The advantage of a deeper tank is that the turtles' diving and hunting abilities can be tested more thoroughly before reintroducing them into the wild. Loggerhead Turtles are given live prey for that purpose. Fully recovered turtles are set free close to the place where they were found. Some individuals are satellite tagged in an effort to learn more about their foraging grounds, migration routes, and winter habitats. Tracking information is publicly available on http://www.seaturtle.org/tracking/?project_id=674. The release of turtles is often made into a media event, which helps in raising public awareness. A volunteer, transportation, and information network is being built in the hope of seeing fewer dead sea turtles washed ashore in the future. DEKAMER also teaches fishermen the early signs of "a sea turtle in trouble" and encourages them to catch individuals that are floating or slow to dive when approached by boat. This is usually an indication of illness or injury. During school outings to the center, children between the ages of 8 and 18 are taught about the turtles' biology, their habitats and common threats (M. Tekin, pers. comm.).

A relatively new and uncommon problem is the occurrence of "turtle attacks" in Turkish waters. Four individuals were admitted to the center after having reputedly attacked and bitten swimmers in the water. Loggerhead Turtle 'Osman' (Fig. 12) is said to have bitten 20 people in Kaş/Antalya (M. Tekin, pers. comm.; see also newspaper article http://www.habervitrini.com/ haber/caretta-caretta-kadinin-kalcasini-isirdi-620040/). Restaurant owners and tourists in Kaş are reported to feed wild turtles on a regular basis. Scientists at DEKAMER believe that sea turtles can be conditioned like mammals and other organisms. They will associate human beings with food and approach them when hungry. This behavior poses two problems. First, the swimmers' and turtles' health and well-being are at stake during a close encounter. Turtles that do not keep their distance can easily be hurt by people who wish them harm. Second, bad publicity does not help the conservation cause. In an

attempt to ameliorate such encounters, "aggressive turtles" are captured, brought to the center, and fed fish without visual cues on the presence of humans (i.e. the staff hide when throwing turtle feed into the tanks). Visitors to the center are now told about the dangers of feeding turtles in the wild (M. Tekin, pers. comm.). In order not to accustom hospitalized turtles to people, they should not be fed by hand and the tanks should be outside the visitor area. Only individuals without hope of being set free should be on display (RAC/SPA 2004).

In addition to the tanks, a fish kitchen and the volunteers' quarters, DEKAMER has an x-ray unit, an operating room, and a laboratory for chemical analyses. Surface surgeries, such as the removal of fishing hooks, monofilament lines and epibiont overgrowth, are carried out at the center. Inner surgery is carried out at the Department of Veterinary Medicine at Pamukkale University. Costs of intensive care cases, where tube feeding is necessary, amount to about 400-500 Turkish Lira per three months. DEKAMER does not euthanize moribund turtles. Analgesics are administered in an effort to make their last days – to months (author's note) – as comfortable and pain-free as possible (M. Tekin, pers. comm.). Blood analyses are undertaken monthly. The parameters investigated are red and white blood cell counts and glucose and lactose levels. In order to establish a standardized hemogram, blood values of individuals in the wild are compared to values of turtles under treatment. Hormone and toxicity (e.g. mercury, PCB, DDT) levels cannot be investigated owing to lack of equipment and funds (M. Tekin, pers. comm.).

When visiting DEKAMER on 23 July 2012, nine adult turtles and ten hatchlings (Fig. 11) were at the center. Four individuals were soon to be satellite tagged before being set free. About ten turtles had died this year so far. One individual had suffered severe harpoon wounds; another had died from a machete cut to its head. No animals had been released up until the above date (M. Tekin, pers. comm.).

The turtles under treatment at the time of our visit (animal data provided by DEKAMER on site):

AKUT, *Caretta caretta*, found in Bodrum, admitted 20 July 2012, emaciated, large amount of parasites, respiratory infection (?), 15-20 years old, gender unknown

ALI RIZA, *Caretta caretta*, found in Dalyan River, admitted 19 July 2012, injured carapace, flipper entangled in fishing line and pierced with a hook, 40-45 years old, male

ANIL, *Caretta caretta*, found in Dalyan River, admitted 15 June 2012, fractured carapace, missing flipper, 40-45 years old, male

AYŞEGÜL, *Caretta caretta*, found in Bodrum, admitted 9 April 2012, extremely underweight and weak, 65-70 years old, female

FETHIYE, *Chelonia mydas*, found in Fethiye, admitted 1 March 2012, buoyancy disorder, 15-20 years old, female (Fig. 13)

HAKAN, *Caretta caretta*, found in Dalyan River, admitted 1 December 2011, ingestion of fishing hook and monofilament, tongue pierced with hook, 40-45 years old, male

NURI, *Caretta caretta*, found in Dalyan River, admitted 8 September 2011, carapace injured and flipper cut off by boat propeller, 15-20 years old, male? (Fig. 14)

OSMAN, *Caretta caretta*, found in Kaş, admitted 19 July 2012, aggressive towards humans, attacked swimmers, 40-45 years old, male (Fig. 12)

SIMGE, *Caretta caretta*, found in Dalyan River, admitted 30 September 2011, missing flipper (shark attack?), fractured carapace owing to collision with watercraft, fungal wound infection, 30-35 years old, female (Fig. 15)

DEKAMER's annual reports are available online: http://caretta.pau.edu.tr/2009rapor.pdf, http://caretta.pau.edu.tr/2010rapor.pdf, http://caretta.pau.edu.tr/2011rapor.pdf.

Fig. 8 Convalescence tanks at DEKAMER.
Abb. 8 Genesungsbecken DEKAMER.
(Photo: J. Ullmann)

Fig. 10 Tanks donated by BTC and TUI.
Abb. 10 Becken gespendet von BTC und TUI. (Photo: J. Ullmann)

Fig. 12 Loggerhead Turtle 'Osman'.
Abb. 12 Unechte Karettschildkröte Osman.
(Photo: S. Prader)

Fig. 14 Loggerhead Turtle 'Nuri'.
Abb. 14 Unechte Karettschildkröte Nuri.
(Photo: S. Prader)

Fig. 9 Medium-sized swimming tank.
Abb. 9 Mittelgroßes Becken.
(Photo: J. Ullmann)

Fig. 11 Hatchlings swimming in a tank.
Abb. 11 Hatchlinge schwimmen im Becken.
(Photo: J. Ullmann)

Fig. 13 Green Turtle 'Fethiye'.
Abb. 13 Grüne Meeresschildkröte Fethiye.
(Photo: J. Ullmann)

Fig. 15 Loggerhead Turtle 'Simge'.
Abb. 15 Unechte Karettschildkröte Simge.
(Photo: J. Ullmann)

ACKNOWLEDGEMENTS

Thanks go to Christine Fellhofer, Marie Lambropoulos, and Evelyn Rameder for their assistance in the field, and to Michael Stachowitsch, who taught me to care about our oceans. I appreciate the time that Meryem Tekin took to conduct an interview with me.

I also wish to thank Sigrid Prader for providing me with photos of DEKAMER's turtles, and Sabine Gasper-Mautes for technical assistance in the designing of the maps.

Last but not least, I want to thank Karola Gürtekin and her family for making our stay in Çaliş such a pleasure. Thanks for all the coffee, cakes, and good talking!

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M. Tekin 2012: pers. comm., 23 July 2012

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http://caretta.pau.edu.tr/2009rapor.pdf (5.9.2012)

http://caretta.pau.edu.tr/2010rapor.pdf (5.9.2012)

http://caretta.pau.edu.tr/2011rapor.pdf (5.9.2012)

http://www.euroturtle.org/distrib.htm (5.9.2012)

http://www.habervitrini.com/haber/caretta-caretta-kadinin-kalcasini-isirdi-620040/ (5.9.2012)

http://www.seaturtle.org/tracking/?project_id=674 (5.9.2012)

## APPENDIX

This is a list of Mediterranean sea turtle rescue centers* I found on the internet (latest update: 5 Sept 2012). It is based on the institutions listed by Kasparek (2001) and RAC/SPA (2004).

It is noninclusive and should be taken as an invitation to be completed with the names of those organizations the author was unaware of at the time.

*The term rescue center refers to rescue centers and first aid stations / emergency centers alike.

| | |
|---|---|
| CROATIA | Marine Turtle Rescue Center, Aquarium Pula, Fort Verudela, Verudela bb, 52100 Pula, www.aquarium.hr, infos@aquarium.hr |
| FRANCE | Centre d´Etudes et de Sauvegarde des Tortues Marines de Méditerranée, Avenue du Palais de la Mer, BP 106, 30240 Le Grau-du-Roi, www.cestmed.org, contact@ cestmed.org |
| GREECE | ARCHELON – Sea Turtle Protection Society of Greece (STPS), Glyfada, Solomou 57, 10432 Athens, www.archelon.gr, stps@archelon.gr |
| | First Aid Station Amvrakikos Bay (Kopraina), www.archelon.gr |
| | First Aid Station Pagalohori of Rethymno, Arkadi, Crete, www.archelon.gr |
| | Hellenic Center for Marine Research, Hydrobiological Station of Rhodes, Cos Street, 85100 Rhodes, www.hcmr.gr, hsr@hsr-ncmr.gr |
| ISRAEL | Israel Sea Turtle Rescue and Rehabilitation Center, Mikhmoret, Israelseaturtle@npa. org.il, (info: www.israeltraveler.org/en/site/national-center-for-sea-turtle-rescue) |
| ITALY | |
| Basilicata | Centro di recupero tartarughe marine di Policoro, c/o Circolo Velico Lucano, Via Lido, 75025 Policoro (MT), www.tartanet.it |
| Calabria | Centro Recupero Tartarughe Marine Brancaleone, Piazza Stazione, 89036 Brancaleone (RC), www.tartanet.it |
| | S.O.S. Caretta, Centro Recupero e Soccorso Area Marina Protetta Capo Rizzuto, 88900 Crotone (KR), www.riservamarinacaporizzuto.it, cappa@riservamarina caporizzuto.it |
| Campania | Centro di Recupero Tartarughe Marine di Punta Campanella, Via Padre Rocco 40, 80061 Massa Lubrense (NA), www.tartanet.it, tartanetpuntacampanella@hotmail.it |
| | Stazione Zoologica Anton Dohrn, Acquario di Napoli, Villa Comunale 1, 80121 Napoli (NA), www.szn.it, stazione.zoologica@szn.it |
| | Turtle Point, Via Cocchia 28, 80124 Bagnoli (NA), www.szn.it, gio.dema@szn.it |
| E. Romagna | Fondazione Cetacea Onlus, Viale Torino 7/A, 47838 Riccione (RN), www.tartanet.it, www.fondazionecetacea.org, informazione@fondazionecetacea.org |
| Lazio | Centro Recupero Sperlonga, Località Villa di Tiberio, 04029 Sperlonga (LT), (info: www.vittimedellacaccia.org/centri-recupero-animali-selvatici/413-lazio.html) |

| | |
|---|---|
| Puglia | Centro cura tartarughe marine, Università degli Studi di Bari Aldo Moro, Facoltà di Medicina Veterinaria, Piazza Umberto I, 1, 70121 Bari (BA), www.uniba.it, urp@uniba.it |
| | Centro Recupero Tartarughe Marine del Salento, Parco Naturale Regionale Bosco e Paludi di Rauccio, 73100 Lecce (LE), www.tartanet.it, www.crtmsalento.it (site under construction), info@crtmsalento.it |
| | Centro Recupero Tartarughe Marine Manfredonia – Legambiente, Parco Nazionale del Gargano, Oasi Lago Salso, 71043 Manfredonia (FG), www.tartanet.it |
| Sardegna | Centro di Recupero del Sinis delle tartarughe e dei cetacei (CReS), Piazza Eleonora 1, 09072 Cabras Càbras (OR), www.areamarinasinis.it, ambiente@areamarinasinis.it |
| | Centro Ospedalizzazione Tartarughe, c/o Laguna di Nora (CA), posta c/o Cooperativa Ittica Nora, Via Santa Croce 23, 09010 Pula (CA), www.tartanet.it |
| | Centro Recupero Tartarughe Marine dell' Asinara, Parco Nazionale dell' Asinara, Isola dell' Asinara, Località Fornelli, 07046 Porto Torres (SS), parco@asinara.org, (info: www.parks.it/parco.nazionale.asinara/cen_dettaglio.php?id=549) |
| Sicilia | Centro di Recupero delle Tartarughe Marine di Lampedusa, Centro di Prima Accoglienza, Contrada Grecale, 92010 Lampedusa (AG), dafregg@tin.it, (info: www.siciliaparchi.com/_specialeCRFS.asp?voce=C) |
| | Centro Recupero Provinciale Fauna Selvatica e Tartarughe Marine, SP 29, 92011 Cattolica Eraclea (AG), www.tartanet.it |
| | Centro Recupero Tartarughe Marine di Linosa, Via Pozzolana di Ponente 13, 92010 Linosa (AG), www.tartanet.it, www.marineturtle.it, Info@marineturtle.it |
| | Centro Regionale Recupero Fauna Selvatica e Tartarughe Marine (C.R.R.F.S. & T.M.), Centro di Recupero specializzato per la cura e la riabilitazione di Tartarughe Marine, Via Generale Girlando 2, 97013 Comiso (RG), www.tartanet.it, crfscomiso@virgilio.it |
| | Centro Ricerca Delfini Lampedusa, Lungomare Luigi Rizzo 157/159, 92010 Lampedusa (AG), www.tartanet.it |
| | Filicudi WildLife Conservation, Pronto Soccorso Tartarughe Marine dell' Arcipelago Eoliano, Località Stimpagnato, Isola di Filicudi, 98055 Lipari (ME), www.filicudiconservation.com, info@filicudiconservation.com |
| | Società di Ricerca Marina NECTON, Via Celona 11, 98165 Messina (ME), www.necton.it, info@necton.it |
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