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Short note

Preliminary report on the status of marine turtle nesting populations on the Mediterranean coast of Egypt

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Abstract

The Mediterranean coast of Egypt was surveyed to determine the location of marine turtle nesting rookeries; the presence of turtle emergence tracks, nests and eggs were recorded. Conclusive evidence was found that both *Caretta caretta* and *Chelonia mydas* nest on the Mediterranean coast of the Sinai peninsula, primarily to the east, in the region surrounding the resort town of El Arish. This population is small and under intense pressure from human activities. Capture of adult turtles, human predation of eggs and rapid beach development threaten to eradicate this population in the near future. As the status of nesting populations in the area is fragile the immediate implementation of basic conservation measures such as public education programs, protection of nests from predators and translocation of vulnerable eggs, is deemed essential. No evidence of nesting was found in the Nile Delta region; however, large numbers of dead turtles were found washed ashore suggesting that marine turtles congregate in the near shore waters to feed on continental shelf sea grass beds. Limited circumstantial evidence of nesting was found in the eastern region between Alexandria and the Libyan border, nesting activity in this area was negligible. © 2000 Published by Elsevier Science Ltd. All rights reserved.

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1. Introduction

Most of the southern and eastern coastline of the Mediterranean basin has previously been surveyed to determine the location of marine turtle rookeries. Detailed information is available on the status of nesting populations in northern Cyprus (Broderick and Godley, 1996; Glen et al., 1996; Godley et al., 1996), southern Cyprus (Demetropoulos and Hadjichristophorou, 1989, 1995), Greece (Margaritoulis, 1982; Arianoutsou, 1988), Israel (Kuller, 1995, 1999), Libya (Laurent et al., 1995, 1997; Venizelos, 1996), Syria (Kasperek, 1995), Tunisia (Laurent et al., 1990; Laurent and Lescure, 1992) and Turkey (Baran and Kasperek, 1989; Coley and Smart, 1992; Yerli and Demirayak, 1996; Gerosa et al., 1998). In addition, a comprehensive synopsis of the status of marine turtles in the Medi-

terranean region as a whole can be found in Groombridge (1990). In recent years the coast of Egypt has received less attention than that of its eastern Mediterranean neighbours such as Libya and Israel, consequently the exact status of nesting populations in this region is unclear. The western coastline, from Alexandria to El Salum (Fig. 1), was surveyed by Kasperek (1993a) but the coast of the Nile Delta and the Sinai peninsula have not been studied. Several authors have alluded to the fact that marine turtle nesting may occur in these areas (Kasperek, 1993b; Sella, 1981), but until the present study no comprehensive survey had been made.

Almost every beach in the Mediterranean basin that supports a marine turtle rookery is currently under pressure from coastal development (Groombridge, 1990). Loss of suitable nesting sites is probably the primary reason for the recent world-wide decline in marine turtle numbers. This is particularly true in the eastern Mediterranean, where the population status of all nesting species is classified as poor to very poor (Groombridge, 1990). In Egypt, much of the sandy coastline

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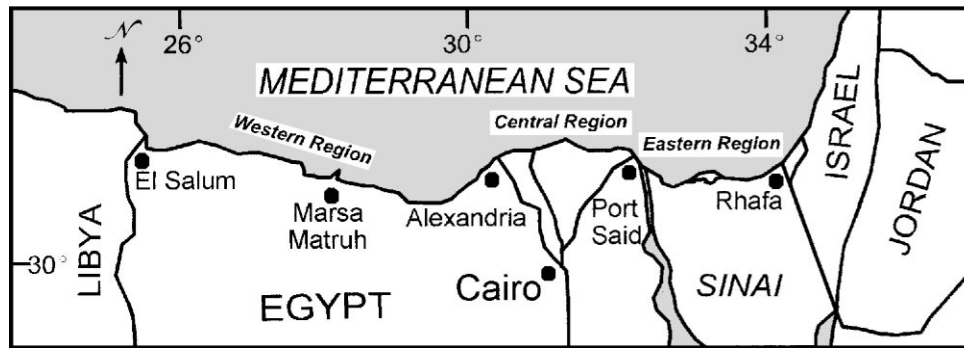


Fig. 1. Map of Egypt showing the positions of the eastern, central and western regions of the Mediterranean coast studied during the 1998 survey.

west of Alexandria has already been extensively developed for tourism, invariably resulting in degradation of beaches to such an extent that they become unsuitable as nesting sites. The Nile Delta coast is relatively undeveloped as is the coastline between Marsa Matruh and the border with Libya. The northern coast of the Sinai peninsula is also largely undeveloped, but this situation is changing; following the end of the Israeli occupation of the area in the mid 1970s the region has been rapidly re-populated and this threatens to degrade the few remaining nesting beaches that still exist along the Mediterranean coastline. In addition to loss of habitat, turtles feeding and nesting on and around the Egyptian coast are also exposed to pressure from fishing activities. Although illegal, it is estimated that several thousand adult turtles (which make up part of the by-catch for many trawlers operating off Egypt's Mediterranean coast) are slaughtered for food each year and sold at the fish markets in Alexandria (Laurent et al., 1996).

Only two species of marine turtle are known to nest on Mediterranean shores, the loggerhead (*Caretta caretta*) and the green turtle (*Chelonia mydas*). The leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempi*) and hawksbill (*Eretmochelys imbricata*) turtles are occasional visitors to the area (Groombridge, 1990). As of 1988, the global status of *C. caretta* was described as "vulnerable", that of the remaining four species was described as "endangered" (IUCN, 1988). This paper presents the first year's results of a three year study to assess the status of nesting populations in the region, with a view to advising the Egyptian Environmental Affairs Agency as to which beaches should be considered for protected status.

2. Methods

During the period 1 June to 1 September 1998 (the main marine turtle nesting season in the eastern Mediterranean; Baran and Kasperek, 1989; Demetropoulos and Hadjichristophorou, 1995) 616.5 km of sandy coastline, suitable for marine turtle nesting, was sur-

veyed. Egypt's Mediterranean coast is naturally divided into three regions; the eastern (Sinai) region from Rhafa to Port Said; the central (Delta) region from Port Said to Alexandria; and the western region from Alexandria to El Salum (Fig. 1). For the purpose of the survey the coast was divided into 74 beaches of variable length, usually a stretch of coastline lying between two landmarks, such as villages, resorts, etc. Each beach was identified with a unique code consisting of a number and a letter, signifying the order and region in which the beach was surveyed. The coordinates of the beginning and end of each beach were recorded using a Magellen 2000 global positioning system (GPS) and checked against 1:50 000 maps of the area.

Surveys were performed during daylight by two people; this involved walking the length of a beach from east to west, one person on the waterline the other following a parallel path 4–5 m above the high tide mark; newly formed emergence tracks from the previous night and tracks up to 3 weeks old located above the high water line were found. Due to the large distances covered in this study the frequency with which individual beaches were surveyed was low (i.e. once in the western and central regions, three times in the eastern region), therefore estimates of nesting populations are minima. The total number of emergences found on each beach was recorded and the species identified from track morphology. If digging had occurred the nest was investigated to check if eggs had been laid.

In addition to identifying nesting beaches an initial assessment of the potential threats to nesting turtles in each region was made. The species, location, and curved carapace length (CCL) of any adult turtles found stranded on beaches during the survey was also recorded.

3. Results

3.1. Beach inventory

In the eastern region 200.7 km of sandy beach was surveyed; this accounted for most of the 220 km of

coastline between Rhafa and Port Said. Of the 260 km of coastline lying in the central region between Port Said and Alexandria, 166.5 km is sandy shore and was included in the survey. In the western region all those beaches identified by Kasperek (1993b) as being suitable for marine turtle nesting were re-surveyed; this incorporated 249.3 km of the 602 km of coastline between Alexandria and El Salum.

3.2. Turtle activity

Details of the 30 beaches on which evidence of nesting activity and/or stranded turtles were found are summarized in Table 1; a further 44 beaches with no positive record of activity are detailed in Appendix A.

3.2.1. Eastern region

In total, 106 emergence tracks were found, 93 were *C. caretta* tracks, eight *C. mydas*, and five unidentified. Of these emergences 74 exhibited evidence of nest digging, 67 by *C. caretta* and seven by *C. mydas*. Egg deposition was confirmed in 21 of the 74 nests, 20 clutches were identified as *C. caretta*, while only one could be positively identified as being laid by *C. mydas*. The numbers of tracks, nests and eggs found on each beach are summarized in Fig. 2. The highest concentration of tracks and nests was found on beach 7E, where 36% (38) of all the emergence tracks were found, and 38% (8) of all confirmed egg depositions. One *C. caretta* nest on beach 10E was found to have recently hatched when the beach was later re-surveyed, the nest had contained a total of 78 eggs of which 72 hatched successfully, three were found to be unfertilized and three embryos had died in the early stages of development.

A total of 26 dead turtles were found along this 200.7 km stretch of coastline (0.129/km), of which 16 were *C. caretta*, six *C. mydas*, one *D. coriacea* and three unidentified.

3.2.2. Central region

No evidence of marine turtle nesting was found during the survey of the Nile Delta coast. However, of the three regions this area had the highest density (0.138/km) of dead stranded turtles: 18 *C. caretta*, one *C. mydas* and four unidentified (Table 1).

3.2.3. Western region

Limited circumstantial evidence of marine turtle nesting was found; three sets of *C. caretta* emergence tracks were found in close proximity, on beaches 37W and 38W, and appeared to have been made by a single individual. No eggs were found as a result of these emergences and turtle nesting could not be conclusively confirmed.

Four dead *C. caretta* and one dead *C. mydas* were found stranded along the 249.3 km of coastline: this was

the lowest density (0.02/km) found in the three regions covered. Three *C. caretta* carapaces were recovered from coastal military posts located on beach 29W. Interviews with soldiers revealed that two of these turtles had been caught earlier in the year with hook and line (the soldiers had later eaten both turtles); the third turtle was found dead washed up on the shore. A fish restaurant in the vicinity of beach 2W had nine marine turtle carapaces on display. When the proprietor was questioned he revealed that turtles were readily available for purchase in the fish markets of Alexandria.

3.3. Threats to nesting turtles

3.3.1. Predation

Evidence was found that in addition to human predation on adult turtles caught at sea, nests in northern Sinai were also pilfered for eggs; signs of human disturbance were found at 10 nests located on beaches 3E and 7E. The major non-human predator appeared to be the ghost crab (*Ocypode* spp), which can predate both turtle hatchlings and eggs (Stancyk, 1982; Arndt, 1994). There are very high numbers of ghost crabs on the nesting beaches of northern Sinai and the overall impact of these predators on hatchling success is unknown.

3.3.2. Pollution

The whole of the Egyptian Mediterranean coast is polluted with non-biodegradable ocean borne debris such as plastic, rubber and nylon, most beaches are also polluted to a greater or lesser degree with oil and tar. The most polluted areas were in the western region, the majority of beaches being classified as 'moderately', 'heavily' or 'very heavily' polluted. None of the nesting beaches on the eastern Sinai were as severely polluted as those in the western region.

3.3.3. Beach development

The major threat to nesting beaches is the 18 km of sea front development around the rapidly expanding resort of El Arish, which has already engulfed part of beach 7E, the most important nesting area recorded.

4. Discussion

4.1. Nesting

Conclusive evidence (i.e. confirmed egg deposition/hatchling emergence), that both *C. caretta* and *C. mydas* are nesting on the eastern Sinai coast of Egypt was found. However, preliminary results suggest that the nesting population utilizing this area is small, probably not exceeding 20 females/year. Results from the Sinai coast appear to be consistent with data reported from

Table 1
Summary of evidence of turtle nesting activity and stranded turtles found on beaches along the Mediterranean coast of Egypt during the period 1 June to 1 September 1998^a

I.D.	Orientation	Co-ordinates (north/east)	Length (km)	Comments
Eastern Region — Rhafa to Port Said				
1E	Rhafa	31° 19' 16/34° 13' 01 31° 16' 20/34° 08' 37	9.7	Tracks/nests found. 1 dead <i>D. coriacea</i> (CCL = 126 cm).
2E	El Sheik Zwayed	31° 16' 18/34° 02' 47 31° 13' 11/34° 02' 47	11.0	Tracks/nests/eggs found.
3E	El Shalak	31° 13' 11/34° 02' 49 31° 11' 45/33° 58' 29	9.0	Tracks/nests found.
4E	El Kharrūba	31° 11' 45/33° 58' 29 31° 09' 27/33° 51' 36	11.5	Tracks/nests found. 1 dead <i>C. caretta</i> (CCL = 60 cm), 1 dead <i>C. mydas</i> (CCL = 36 cm).
6E	El Masaid	31° 08' 07/33° 46' 27 31° 06' 47/33° 36' 56	12.0	Tracks/nests/eggs found. 1 dead <i>C. caretta</i> (CCL = 59 cm).
7E	Abo Flifel	31° 06' 47/33° 36' 56 31° 07' 24/33° 29' 17	11.0	Tracks/nests/eggs found. 2 dead <i>C. caretta</i> (CCL = 124, 70 cm).
8E	Zaranik protected area	31° 07' 48/33° 28' 56 31° 11' 34/33° 21' 34	12.0	Tracks/nests found. 1 dead <i>C. caretta</i> (CCL = 63 cm). 1 dead unidentified ^b
10E	Bardawil, to Bogaz # 2.	31° 12' 59/33° 15' 50 31° 13' 40/33° 11' 14	9.0	Tracks/nests/eggs found. 1 dead <i>C. mydas</i> (CCL = 30 cm).
11E	Bardawil, Bogaz #2	31° 13' 40/33° 11' 14 31° 13' 41/33° 07' 05	10.0	Tracks/nests/eggs found. 1 dead <i>C. caretta</i> (CCL = 69 cm).
12E	Bardawil, El Kalls	31° 13' 41/33° 07' 05 31° 10' 51/33° 00' 37	14.0	Tracks/nests/eggs found. 5 dead <i>C. caretta</i> (CCL = 51, 47, 65, 24, ^b , cm); 1 dead <i>C. mydas</i> (CCL = 28 cm).
14E	Bardawil, El Shagara	31° 08' 45/32° 55' 24 31° 05' 06/32° 47' 46	14.5	Tracks/nests/eggs found. 3 dead <i>C. caretta</i> (CCL = 59; 61; 66 cm); 1 dead <i>C. mydas</i> (CCL = 28 cm); 1 dead unidentifiable. ^b
15E	Bardawil, El Mohamadyat	31° 05' 06/32° 47' 46 31° 03' 34/32° 41' 05	11.0	Tracks/nests/eggs found.
16E	Romana	31° 03' 34/32° 41' 05 31° 04' 19/32° 33' 47	14.0	Tracks/nests/eggs found. 1 dead <i>C. caretta</i> (CCL = 90 cm); 1 dead <i>C. mydas</i> (CCL = 44 cm).
17E	Salina Inlet	31° 04' 19/32° 33' 47 31° 07' 22/32° 30' 11	8.0	1 dead <i>C. caretta</i> (CCL = 64 cm); 1 dead <i>C. mydas</i> (CCL = 70 cm).
18E	El Malaha	31° 07' 22/32° 30' 11 31° 13' 13/32° 22' 40	14.0	1 dead turtle unidentified. ^b
Central Region — Port Said to Alexandria				
1C	Port Said — Air Port	31° 16' 39/32° 15' 41 31° 21' 59/32° 03' 38	23.0	1 dead <i>C. caretta</i> ^b , 1 dead <i>C. mydas</i> (CCL = 29.5 cm).
3C	Ras Al Barr	31° 30' 07/31° 48' 20 31° 29' 10/31° 45' 51	4.5	1 dead <i>C. caretta</i> (CCL = 14 cm).
4C	New Diamatta	31° 28' 48/31° 44' 04 31° 26' 36/31° 33' 54	18.5	1 dead <i>C. caretta</i> (CCL = 53 cm).
5C	West of Izbat Jamasa	31° 27' 10/31° 31' 03 31° 35' 32/31° 08' 39	39.0	2 dead <i>C. caretta</i> (CCL = 72, 67 cm).
6C	Lake Burullus	31° 32' 29/30° 49' 31 31° 28' 55/30° 23' 31	46.0	8 dead <i>C. caretta</i> (CCL = 73, 65, 51, 42, 48, 54, 76, 60 cm), 3 dead unidentified (CCL = 73, 65, 75 cm).
7C	Rashid to Idku	31° 27' 54/30° 21' 49 31° 19' 11/30° 16' 57	19.0	3 dead <i>C. caretta</i> (CCL = 59, 69, 52 cm), 1 dead unidentified (CCL = 71 cm).
8C	Idku to Al-Mandara	31° 19' 11/30° 16' 57 31° 16' 52/30° 12' 44	8.0	2 dead <i>C. caretta</i> (CCL = 53, 55 cm).
Western Region — Alexandria to El Salum				
<i>Gulf of Arab</i>				
1W	Abu Talat	31° 04' 39/29° 42' 03 31° 03' 38/29° 40' 52	3.0	1 dead <i>C. caretta</i> (CCL = 63 cm).
10W	West of Aida Hotel beach	30° 50' 31/29° 13' 54 30° 49' 38/29° 10' 09	6.5	1 dead adult <i>C. caretta</i> . ^b
11W	Badrid tourist village	30° 49' 08/29° 05' 28 30° 49' 36/29° 10' 08	8.0	1 dead <i>C. caretta</i> (CCL = 16.6 cm).
<i>Abu Hashaifa Bay</i>				
20W	Ras Al-Hikma	31° 12' 49/27° 51' 59 31° 14' 19/27° 51' 58 31° 13' 10/27° 52' 14	0.3 0.3 0.2	1 dead <i>C. mydas</i> (CCL = 34 cm). Three small coves, (mean co-ordinates).
22W	Ras Hawala	31° 11' 03/27° 35' 09 31° 12' 15/27° 31' 52	6.0	1 dead <i>C. caretta</i> (CCL = 11.5 cm).
<i>West of Marsa Matruh</i>				
29W	Zawyet el Mithniyan	31° 26' 27/26° 55' 54 31° 27' 04/26° 47' 48	8.2	9 beaches, ≤1.5 km. 3 <i>C. caretta</i> carapaces recovered (CCL = 42, 57, 61 cm).
37W	El Maktela	31° 33' 58/26° 10' 48 31° 34' 41/26° 08' 17	4.5	2 <i>C. caretta</i> tracks, both with excavation, no eggs found.
38W	Kamin Maktela to Sidi Hama	31° 34' 41/26° 06' 24 31° 35' 07/26° 06' 24	4.5	1 <i>C. caretta</i> track, with excavation, no eggs found.

^a The coast is divided into three regions (Fig. 1); sites are listed from east to west with the co-ordinates of the eastern and western margins provided in each case.

^b No measurements taken.

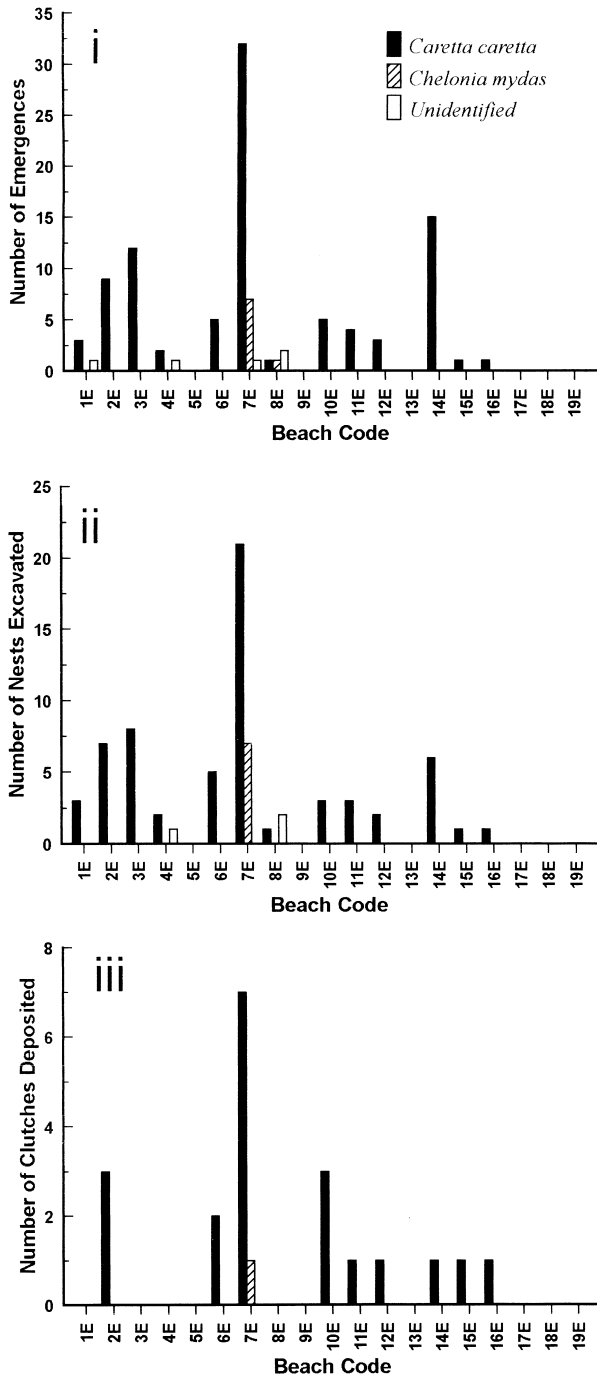


Fig. 2. The number of (i) emergence tracks, (ii) nest excavations and (iii) confirmed clutch depositions, found on each beach on the Mediterranean coast of the Sinai Peninsula (eastern region) during the 1998 survey.

other parts of the southeastern Mediterranean basin. In Israel, 40 *C. caretta* and 13 *C. mydas* nests were found along 190 km of coastline during the 1998 season; however, this appears to have been an exceptional year, during the previous 5 year period the annual mean numbers of nests found were only 27.4 *C. caretta* and 2.2 *C. mydas* (Kuller, 1999).

The main turtle nesting beach in the eastern region (and indeed along the entire Egyptian Mediterranean coast) was a 22 km stretch of sandy coastline lying to the west of the resort town of El Arish (7E). Fortunately, 8 km of this beach lies within the boundaries of the Zaranik protected area, a biosphere reserve. However, beach development is already underway on the remaining 14 km and this area has been ear-marked as a tourist resort.

No evidence was found to suggest that nesting occurs in the central region between Port Said and Alexandria. It is possible that the high mud/silt content of the sand in the delta renders the beaches unsuitable as nesting sites. However, the highest density of stranded turtles was found in this region. The continental shelf of the Nile Delta represents an area of c. 23,000 km² (Laurent et al., 1996) and is covered in green meadows of the sea grass *Posidonia oceanica* at a depth of 5–8 m, while deeper meadows cover extensive areas around Alexandria and Port Said (Mostafa et al., 1990). Fisheries capture and landing statistics for the area indicate that this fertile continental shelf acts as a feeding ground for large numbers of turtles (FAO, 1995), hence the high density of corpses found washed ashore. Due to the advanced state of decomposition of most of the corpses it was impossible to comment on the cause of death in the majority of cases.

In the western region, very limited circumstantial evidence of marine turtle nesting was found. This is consistent with results from Kasparek (1993b) who concluded that marine turtle nesting activity in this region was “negligible”. The low density of stranded turtles found in this region suggests that very few individuals are active in the coastal waters between Alexandria and the Libyan border. Observations made during the survey found that significant sea grass agglomerations only occurred on nine of the 47 beaches studied (i.e. 17W; 25W; 27W; 29–31W and 43–45W), and very few mollusc shells were found on any beach. This supports the conjecture alluded to by Kasparek (1993b) that, “the sea off the western Egyptian coast does not provide enough diet for marine turtles and therefore they avoid this area”.

4.2. Conservation

The small populations of *C. caretta* and *C. mydas* nesting on the northern Sinai peninsula are currently under intense pressure from human activities. The fact that 10 nests exhibited signs of human pilfering of eggs is particularly disturbing considering that only 21 egg depositions could be confirmed for the entire season. The combined effects of the capture of adults at sea, predation of eggs, coastal pollution and development of beaches, threaten to exclude nesting turtles from the Mediterranean coastline of Egypt within the next dec-

ade. An intense public awareness campaign and a conservation program of nest protection and/or re-location is required immediately if this population is to survive.

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Appendix A

Inventory of all beaches surveyed along the Mediterranean coast of Egypt where no turtle activity was recorded. The coast is divided into three regions (Fig. 1); sites are listed from east to west with the co-ordinates of the eastern and western margins (above and below) provided in each case.

I.D.	Orientation	Co-ordinates (north/east)	Length (km)	Date (1998)	Comments
Eastern Region — Rhafa to Port Said					
5E	El Arish	31° 09' 27/33° 51' 36 31° 08' 07/33° 46' 27	9.0	8/6 2/7 5/8	Very busy tourist beach
9E	Bardawil, to inlet #2	31° 11' 34/33° 21' 34 31° 12' 19/33° 17' 00	8.0	12/6 4/7 8/8	Very polluted. No public access
13E	Bardawil, to inlet #2	31° 10' 51/33° 00' 37 31° 08' 39/32° 55' 58	10.0	24/6 7/7 18/8	Very polluted No public access
19E	Port Said/Port Faud	31° 13' 13/32° 22' 40 31° 13' 31/32° 21' 34	3.0	30/6 14/7 20/8	No public access to beach
Central Region — Port Said to Alexandria					
2C	El Deepa Village	31° 21' 59/32° 03' 38 31° 24' 40/32° 00' 12	8.5	19/7	Tourist beach, some fishing
Western Region — Alexandria to El Salum					
<i>Gulf of Arab</i>					
2W	Sidi Kerir	31° 01' 01/29° 36' 52 30° 59' 51/29° 35' 07	4.7	1/6	Tourist beach
3W	Sidi Kerir (cont.)	30° 59' 51/29° 35' 07 30° 58' 18/29° 32' 38	5.5	1/6	Tourist beach; heavily developed
4W	Abu Sir	30° 58' 05/29° 32' 34 30° 59' 54/29° 31' 20	4.2	2/6	Tourist beach; heavily developed
5W	Burg El Arab	30° 56' 44/29° 29' 42 30° 56' 01/29° 28' 13	3.0	2/6	Tourist beach; heavily developed
6W	El Zumarada beach	30° 55' 57/29° 28' 13 30° 55' 03/29° 26' 09	3.6	2/6	Tourist beach; heavily developed
7W	Davi Alla beach	30° 55' 04/29° 26' 09 30° 54' 01/29° 23' 58	8.0	3/6	Beach mostly undeveloped
8W	El Tugarene Village beach	30° 53' 08/29° 21' 48 30° 52' 15/29° 19' 25	8.0	3/6	Established tourist resort

(continued on next page)

I.D.	Orientation	Co-ordinates (north/east)	Length (km)	Date (1998)	Comments
9W	El Hammam	30° 51' 41/29° 17' 26 30° 50' 31/29° 13' 54	6.0	4/6	Established tourist resort
12W	Green Beach, El Omied	30° 49' 09/29° 05' 31 30° 49' 37/29° 01' 29	5.2	5/6	Tourist beach
13W	El Alamein	30° 57' 27/28° 46' 49 30° 59' 45/28° 42' 59	7.0	5/6	Tourist and fishing beach
14W	Sidi Abd El Rahman	30° 59' 45/28° 42' 59 30° 59' 49/28° 41' 05	3.6	5/6	Tourist and fishing beach
<i>Gulf of Hikma</i>					
15W	Ras El Daba	31° 04' 12/28° 28' 09 31° 04' 36/28° 27' 29	2.0	6/6	Limited access, some fishing
16W	West of Ras El Daba	31° 03' 58/28° 18' 57 31° 04' 32/28° 21' 42	4.8	6/6	Beach is isolated
17W	Omm El Nada Beach	31° 05' 05/28° 03' 25 31° 05' 24/28° 06' 31	8.0	6/6	Some tourist use of beach
18W	East of Fuka	31° 05' 14/28° 02' 36 31° 05' 16/28° 00' 39	4.8	7/6	Tourist activity to the west only
19W	Gaouhagra tourist village	31° 05' 25/27° 59' 30 31° 05' 44/27° 56' 09	5.0	7/6	Tourist and fishing beach
<i>Abu Hashaifa Bay</i>					
21W	Marsa Baggūsh	31° 10' 33/27° 40' 10 31° 11' 39/27° 38' 02	5.5	8/6	Tourist beach
23W	Ras Alam el Rūm	31° 14' 51/27° 23' 56 31° 20' 46/27° 20' 52	15.5	9/6	Shore is alternating rock/sand bays
<i>West of Marsa Matruh</i>					
24W	Cleopatra beach	31° 22' 24/27° 11' 19 31° 22' 29/27° 11' 10	0.8	9/6	Busy tourist beach serving the resort of Marsa Matruh
25W	El Niruz village	31° 22' 29/27° 09' 34 31° 22' 36/27° 07' 14	4.5	9/6	Tourist developments at west end of beach
26W	El Obayed village	31° 22' 32/27° 07' 27 31° 22' 56/27° 04' 35	4.5	10/8	Shoreline is marked out for development
27W	Ras Umm el Rakhma	31° 22' 56/27° 04' 35 31° 23' 41/27° 03' 56	2.0	10/6	Tourist beach
28W	Agiba	31° 24' 11/27° 03' 50 31° 24' 42/27° 00' 40	6.0	10/6	Some tourism, most of beach is rocky
30W	Zawyet el Mithniyan (cont)	31° 28' 13/26° 46' 49 31° 28' 25/26° 46' 18	3.0	10/6	No human use of beach
31W	El Nigela	31° 29' 11/26° 40' 00 31° 29' 18/26° 37' 01	5.5	10/6	No turtle activity. No human use of beach
32W	Kamin Nigela to Umm Marzoke	31° 29' 22/26° 36' 58 31° 29' 32/26° 34' 29	4.5	11/6	Beach is isolated, patrolled by military
33W	Dawaia to Kom Marzoke	31° 30' 09/26° 32' 51 31° 29' 41/26° 30' 19	5.0	12/6	Beach is isolated, patrolled by military
34W	Kom Marzoke to El Shammas	31° 29' 36/26° 30' 14 31° 30' 22/26° 27' 42	4.5	11/6	Beach is isolated, patrolled by military
35W	El Shammas	31° 30' 22/26° 27' 42 31° 30' 48/26° 24' 19	6.0	11/6	Beach is isolated, patrolled by military
36W	El Shammas to El Zawida	31° 31' 15/26° 21' 51 31° 31' 40/26° 19' 15	5.0	13/6	Pristine beach very isolated

(continued on next page)

I.D.	Orientation	Co-ordinates (north/east)	Length (km)	Date (1998)	Comments
<i>Gulf of Salum</i>					
39W	El Attouf to Kamin el Attouf	31° 36' 42/25° 59' 24 31° 37' 07/26° 56' 31	6.5	13/6	Beach used by locals from Sidi Barrani
40W	Alam Hamid	31° 36' 53/25° 49' 44 31° 36' 50/25° 49' 27	0.6	14/6	Beach is isolated, three small coves
41W	Taba el Beda	31° 36' 38/25° 48' 47 31° 35' 39/25° 45' 48	7.5	14/6	Beach is very polluted. Some fishing
42W	Buq Buq	31° 34' 03/25° 40' 29 31° 33' 23/25° 38' 48	5.0	14/6	Beach composed of sandy bays
43W	Buq buq to Ras Seiyâda	31° 31' 13/25° 31' 21 31° 30' 44/25° 28' 31	5.5	14/6	Very little public access to beach
44W	Ras Seiyâda to Buq buq	31° 30' 44/25° 28' 31 31° 30' 14/25° 26' 20	4.0	14/6	Very little public access to beach
45W	Alam el Kadad to El Nakala	31° 30' 08/25° 22' 01 31° 30' 07/25° 18' 22	8.0	15/6	Very little public access to beach
46W	El Nakala to El Bourg	31° 30' 07/25° 18' 22 31° 31' 00/25° 13' 24	9.0	15/6	Very little public access to beach
47W	El Salum	31° 31' 00/25° 13' 24 31° 31' 14/25° 10' 12	6.0	15/6	Beach is heavily used by villagers and is very polluted

References

- Arianoutsou, M., 1988. Assessing the impacts of human activities on nesting of loggerhead sea-turtles (*Caretta caretta* L.) on Zákynthos island, Western Greece. *Environmental Conservation* 15 (4), 327–334.
- Arndt, R.G., 1994. Predation on hatchling diamondback terrapin, *Malaclemys terrapin*, by the ghost crab, *Ocyropsis quadrata*. *Florida Scientist* 57 (1), 1–5.
- Baran, I., Kasperek, M., 1989. Marine Turtles in Turkey. Status Survey 1988 and Recommendations for Conservation and Management. World Wide Fund for Nature, Heidelberg.
- Boderick, A.C., Godley, B.J., 1996. Population and nesting ecology of the green turtle, *Chelonia mydas*, and the loggerhead turtle, *Caretta caretta*, in northern Cyprus. *Zoology in the Middle East* 13, 27–46.
- Coley, J., Smart, S.C., 1992. The nesting success of green turtles on beaches at Kazanlı, Turkey. *Oryx* 26 (3), 165–171.
- Demetropoulos, A., Hadjichristophorou, M., 1989. Sea turtle conservation in Cyprus. *Marine Turtle Newsletter* 44, 4–6.
- Demetropoulos, A., Hadjichristophorou, M., 1995. Manual on Marine Turtle Conservation in the Mediterranean. UNEP(MAP)/SPA/IUNC/CWS/Fisheries Department, MANRE, Cyprus.
- FAO, 1995. Statistiques des pêches, captures et quantités débarquées. Vol. 76, 1993. FAO, Rome.
- Gerosa, G., Aureggi, M., Casale, P., Yerli, S.V., 1998. Green turtle nesting at Akyatan beach, Turkey, 1994–1997. *Marine Turtle Newsletter* 81, 4–5.
- Glen, F., Godley, B.J., Kelly, A., 1996. Marine Turtle Monitoring in Turkey by Students from the University of Glasgow: A Report to the British Council, Ankara.
- Godley, B.J., Broderick, A.C., Solomon, S.E., Tippet, R., Malsom, R., 1996. Threats to marine turtles in Northern Cyprus, Eastern Mediterranean. In: Keinath, J.A., Barnard, D.E., Musick, J.A., Bell, B.A. (Eds.). Proceedings of the 15th Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum, NMFS-SEFSC-387, pp. 100–104.
- Groombridge, B., 1990. Marine turtles in the Mediterranean: distribution, population status, conservation. *Nature and Environment Series* 48, 1–98.
- IUCN, 1988. IUCN Red List of Threatened Animals. IUCN, Gland, Switzerland/Cambridge, UK.
- Kasperek, M., 1993a. Survey of the Mediterranean coast between Alexandria and El-Salum, Egypt. *Marine Turtle Newsletter* 63, 8–9.
- Kasperek, M., 1993b. Marine turtle conservation in the Mediterranean. Marine turtles in Egypt. Phase 1. Survey of the Mediterranean coast between Alexandria and El-Salum. Unpublished report to MEDASSET (Mediterranean Association to Save the Sea Turtles) and RAC/SPA (Regional Activity Centre for Specially Protected Areas Tunisia, UNEP).
- Kasperek, M., 1995. The nesting of marine turtles on the coast of Syria. *Zoology in the Middle East* 11, 51–62.
- Kuller, Z., 1995. Nesting of marine turtles in the Mediterranean coast of Israel — Summer 1994. *Israeli Journal of Zoology* 41 (1), 96.
- Kuller, Z., 1999. Current status and conservation of marine turtles on the Mediterranean coast of Israel. *Marine Turtle News Letter* 86, 3–5.
- Laurent, L., Lescure, J., 1992. The status of marine turtles in the Gulf of Gabès (South Tunisia). In: Korsès, Z., Kiss, I. (Eds.). Proceedings of the Sixth Ordinary General Meeting of the Societas Europa Herpetologica, 19–23 August, 1991, Budapest.
- Laurent, L., Nouira, S., Jeudy De Grissac, A., Bradai, M.N., 1990. Les tortues marines de Tunisie: premières données. *Bulletin de la Société Herpétologique de France* 53, 1–17.
- Laurent, L., Bradai, M.N., Hadoud, D.A., El-Gomati, H.M., 1995. Marine Turtle Nesting Activity Assessment on Libyan Coasts, Phase I: Survey of the coast between Egyptian Border and Sirte. RAC/SPA (MAP-UNEP), Tunis.
- Laurent, L., Abd El-mawla, E.M., Bradai, M.N., Demirayak, F., Oruc, A., 1996. Reducing Sea Turtle Mortality Induced by Mediterranean Fisheries Trawling Activity in Egypt, Tunisia and Turkey. Report for the WWF International Mediterranean Programme, WWF Project 9E0103.

- Laurent, L., Bradai, M.N., Hadoud, D.A., El-Gomati, H.M., 1997. Assessment of sea turtle nesting activity in Lybia. *Marine Turtle Newsletter* 76, 2–6.
- Margaritoulis, D., 1982. Observations on Loggerhead sea turtle *Caretta caretta* activity during three nesting seasons (1977–1979) in Zákynthos, Greece. *Biological Conservation* 24, 193–204.
- Mostafa, H.M., Alim, Y., Ata, M., Khalil, A.N., 1990. The Posidonia (L.) meadows of Egyptian waters. Preliminary survey. *Rapp. Comm, int Mer Médit* 32 (1), 5.
- Sella, I., 1981. Sea turtles in the Eastern Mediterranean and Northern Red Sea. In: Bjorndal, K.A. (Ed.), *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, pp. 417–424.
- Stancyk, S.E., 1982. Non-human predators of sea turtles and their control. In: Bjorndal, K.A. (Ed.), *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, pp. 139–153.
- Venizelos, L., 1996. Mediterranean loggerheads are thriving in Libya!. *Marine Turtle Newsletter* 72, 2.
- Yerli, S., Demirayak, F., 1996. Marine turtles in Turkey: A Survey on Nesting Site Status. DHKD, CMS Report No: 96/4, Istanbul.