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MARINE TURTLE NESTING SURVEY AND STRANDING ASSESSMENT FROM TARTUS TO SYRIA'S BORDER WITH LEBANON

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The nesting of sea turtles (*Caretta caretta* and *Chelonia mydas*) was studied along the beach south of Tartus (i.e. *the Beach of Dreams* "Al Ahlam" as far as the border of Syria and Lebanon to the south, a distance of about 40 km. It includes a length of about 10 km suitable for sea turtle nesting. The beach was divided into 7 subsections, each of them between 0.3 and 3 km long. The nesting success was 25% for the loggerhead turtle and 40% for the green turtle. A total of 106 dead marine turtles were observed, including 95 (92%) loggerhead turtles and 11 (8%) green turtles.

Keywords: Sea turtle nesting, stranding, threats, Tartus beach, Syria

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Istraživano je gniježđenje morskih kornjača (*Caretta caretta* i *Chelonia mydas*) od plaže južno od Tartusa (tj. *Plaža snova* "Al Ahlam" sve do granice Sirije i Libanona na jugu, duljine od oko 40 km. To područje uključuje oko 10 km prikladnih za gniježđenje morskih kornjača. Plaža je podijeljena u 7 dijelova, svaki dugačak od 0,3 do 3 km. Uspjeh gniježđenja bio je 25% za glavatu želvu i 40% za zelenu želvu. Zabilježeno je ukupno 106 mrtvih morskih kornjača, uključujući 95 (92%) glavatih želvi i 11 (8%) zelenih želvi.

Ključne riječi: gniježđenje morskih kornjača, nasukavanje, ugroze, plaža Tartus, Syria

INTRODUCTION

Three sea turtle species occur regularly in the Mediterranean; loggerhead turtle (Care*tta caretta*), green turtle (*Chelonia mydas*) and leatherback turtle (*Dermochelys coriacea*) (Casale et *al*., 2018; Rees et *al*., 2004; Türkozan & Kaska, 2010). Loggerhead and green turtles both breed in the Mediterranean, while leatherback turtles from the Atlantic use the region only for foraging (Kasparek *et al*., 2001; Margaritoulis *et al*., 2003). The main loggerhead nesting areas are in Greece, Turkey, Cyprus, Libya and Syria (Kasparek *et al*., 2001; Margaritoulis *et al*., 2003; 2004; Casale & Margaritoulis, 2010; Rees *et al*., 2008) and the main foraging areas are along the North African, Adriatic and north-eastern Ionian continental shelves (Casale & Margaritoulis, 2010; Stokes *et al*., 2015). Green turtle habitats are restricted, with a more easterly distribution. The main green turtle nesting areas are in Turkey, Cyprus and Syria (Kasparek *et al*., 2001; Canbolat, 2004; Rees *et al*., 2008; Casale *et al*., 2018; Saad, 2012). The Mediterranean subpo-

pulation of loggerhead turtles was downgraded in 2015 to Least Concern (LC) from Endangered (EN) according to the IUCN red list criteria. It is assumed that the current status of the Mediterranean subpopulation represents the success of past conservation efforts at nest sites and the Mediterranean subpopulation is subsequently assessed as conservation dependent (Casale & Tucker, 2017). In addition, Mediterranean green turtles are ranked as part of the global classification as Endangered (Seminoff, 2004) and the leatherback turtle as globally Vulnerable (Wallace *et al*., 2004). However, the main conservation efforts were carried out on the nesting beaches of Mediterranean and the main threats in marine habitats still remain.

The presence of loggerhead (*Caretta caretta*) and green sea turtles (*Chelonia mydas*) off the coast of Syria, was first reported by Gruvel (1931) but the nesting beaches were not indicated. The next turtle information to come out of Syria resulted from a rapid assessment survey in 1991 that identified low-level nesting concentrated on a beach south of Lattakia City (Kasparek, 1995). Local researchers noted incidental turtle captures in beach seines, and also observed turtles stranded along the coast (Saad *et al*., 2003). Since 2004 a more extensive coastal survey has been undertaken, primarily to better identify Syria's actual and potential nesting populations (Saad & Rees, 2004; Rees *et al*.,2005; Saad *et al*., 2006; Rees *et al*., 2008) A combination of nocturnal surveys during the nesting season and co-operative efforts with fishermen afforded the first opportunities to observe turtles in the wild to obtain basic biometric data and tag the turtles before they returned to the sea after nesting or were released after being caught in fishing nets. In contrast to Lattakia Beach where nesting has been studied for 10 years (2004-2010) (Saad *et al*., 2010), this is the first time that nesting sites have been studied thoroughly and comprehensively on the coast stretching from the city of Tartus to the Lebanese-Syrian border.

MATERIAL AND METHODS

The nesting and stranding of sea turtles were studied in the beach south of Tartus city (35°35"07 E; 34°51"43 N) as far as the Lebanese border in the south (35°58"24.'16 E; 34°37"58.48 N), a total distance of about 40 km (Fig. 1). Assessment of marine turtle strandings was carried out by direct examination of carcasses and a questionnaire survey of fishermen to confirm their observations about the mortality of sea turtles: The study was undertaken weekly between January 2016 and December 2017, On encountering the dead turtle, the following data were recorded: Area name - date – species identification - straight carapace length (SCL) - note accompanying injury, which depends on the availability of a healthy and soft shield. Estimate the distance between dead turtles during the trip when close to each other. Turtle carapaces were painted to avoid repeat counts (Gardner & Nichols, 2001). Interviews were also conducted with fishermen on the beach about the dangers facing turtles. With respect to nesting, the area was surveyed daily between 20 June to 29 August 2016. Ground patrols were carried out throughout every kilometer of the sandy coast to survey for turtles, turtle tracks and turtle nests. Nesting success and nest numbers were calculated in two ways: 1 - from initial track assessment that did not include clutch identification (Figs. 1, 2). 2 - By summing the number of nests proven by observation of eggs (Fig. 4). The stage of the mature individual and the stage of the young or non-adult individual were determined based on the body length of the dead turtle, both the loggerhead turtle and the green turtle reach sexual maturity in the Mediterranean when body length averages between 60-65 cm (https://seaworld.org, 2020 ; Miller, 1997).

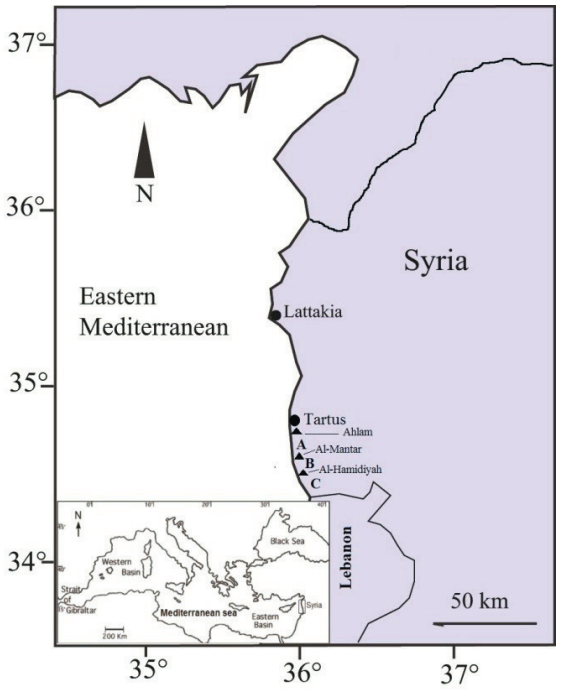

Fig. 1. Study area Between Tratus and the Lebanese border, a total distance of about 40 km

Fig. 2. Green turtle *Chelonia mydas* hatchling track

Fig. 3. Track of loggerhead turtle *Caretta caretta*.

Fig. 4. Egg observation in the nest.

RESULTS AND DISCUSSION

The present study provides the first sea turtle nesting and stranding data from the south of Tartus beach in Syria, and shows that a total of 36 turtle tracks including 13 nests were recorded. The majority of the nests, 11 (84%), were from the loggerhead turtle, *Caretta caretta,* and 2 (16%) were from the green turtle, *Chelonia mydas*. The nesting success rate was 25% for the loggerhead turtle and 40% for the green turtle. The nesting density at the site of the study was 1.3 nest/km, and the overall nesting success rate was 26.5%. The highest number of nests was recorded in Area A (Al Ahlam

Beach and Amrit (35°54"06 E; 34°50"08 N) (Tab. 1). The results showed that the peak of nesting occurred during the second week of July (7 nests). The results of this study reveal a reversal of species prevalence from the northern part of the country, as a similar study previously undertaken on the beach of Shkaifate, south of Lattakia (Rees *et al*., 2010; Saad *et al*., 2010) revealed green turtle nesting was dominant (Fig. 5).

Tab. 1. Monthly variation of stranding turtles number on the three areas (A,B,C)

Month	Area			Number of stranding turtles
	A	B	C	
1	1	0	0	1
2	4	0	0	4
3	1	3	2	6
4	14	9	9	32
5	9	2	0	11
6	4	6	0	10
7	0	6	4	10
8	1	1	11	13
9	1	6	2	9
10	1	2	2	5
11	0	0	0	0
12	1	1	3	5
Total	37	36	33	106

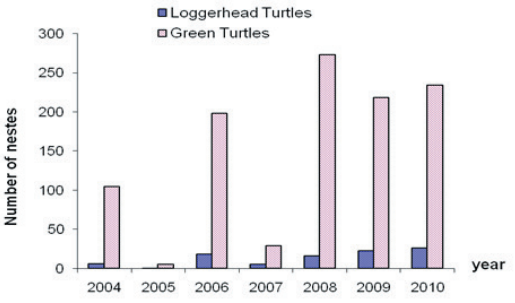

Fig. 5. Variation in the number of turtle nests on Lattakia beach during seven years of survey.

Strandings of Loggerhead turtle were more common during spring and summer. This probably coincided with the increase in fishing activities. Our data agree partially with the observations of Jribi *et al*. (2007) in the Gulf of Gabes (Tunisia), Tomás *et al*. (2008) in the Valencian Community (Spain) and Caracappa *et al*. (2018) on the Sicilian coast. On the other hand Corsini *et al*. (2013) reported that a higher incidence of loggerhead turtle strandings in Rhodes Island was observed in summer, while there were more green turtle strandings in winter.

Surveys indicate that there is interaction of turtles with fisheries as it is speculated that drift net fishing offshore could be the cause of the numbers of dead stranded turtles found; also, the coast is greatly affected by the presence of sea-borne plastic and other waste. The presence of large quantities of litter was noted during this survey. This waste accumulates in some areas in such quantities as to cause hindrance to turtles wishing to come ashore to nest and subsequently for the emerged hatchlings struggling to reach the sea. The strandings indicate that the loggerhead is present year-round in this area. A total of 106 dead marine turtles were observed, including 95 (92%) loggerhead turtles and 11 (8%) green turtles. The results showed that higher numbers of dead green turtles in April (n = 32) with a mortality rate of 0.25 carcasses/km/month (Tab. 1). About 86% of all turtles found were juveniles or sub-adults. The percentage of turtles over 60 cm in length came to 56% (it is assumed that they reach sexual maturity with a length of 60 cm); individuals over 65 cm in length accounted for 28%. Baskal *et al*. (2018) in the Fethiye-Göcek (Turkey) reported that the majority of stranded logger heads were considered to be adults (77.45%), while the majority of stranded green turtles were immature. Timing of marine turtle mortalities and visible injuries suggest that gill net and dynamite fishing were responsible for most of the deaths.

Comparing the results of the current study with the results of the numerous studies carried out in other countries bordering the eastern and southern shores of the Mediterranean Sea, it becomes clear to us that the main threats to sea turtle populations are coastal development (Ilgaz *et al*., 2007), natural predation (Erk'akan, 1993; Broderick & Godley, 1996; Rees *et al*., 2008; Saad *et al*., 2010), incidental catch and intentional killings by fishermen (Casale, 2011), as well as collision with marine craft (Casale & Margaritoulis, 2010). Entanglement in plastic marine debris is also likely to be a major source of mortality (Duncan *et al*., 2017). Incidental catch is considered to be the main threat in the Eastern Mediterranean (Türkozan et *al*., 2013); the results of Levy *et al.* (2015) also show that gillnets and trawlers are the main threats to sea turtles in the Levantine basin. In addition Sonmez (2018) reported that the Fishing activities and marine pollution is the main cause of strandings on Samandağ Beach (eastern Mediterranean coast of Turkey). Oceanic and sub-adult stage individuals were stranded in especially high numbers due to plastic Materials (Sonmez, 2015). Casale (2011) estimated that over 132,000 sea turtles were captured, of which 44,000 die annually in the Mediterranean Sea.

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This study confirms that south of Tartus is likely to be an important feeding and nursery ground, with the loggerhead turtle being the most common species.

CONCLUSION

Conservation efforts on the nesting beaches should therefore not be the only criteria for assessing a population. In this case, the population status of sea turtles in marine habitats and mortality rates, according to stranding data and observations in fisheries, are needed for a comprehensive assessment, especially in Syria. The lack of data on the number of strandings and sea turtle deaths prevents us from making a proper assessment, but the available data shows that we lost at least the same number of sea turtles in the marine habitats that we protected on the nesting beaches of the Tartus beach. Thus, conservation measures should be extended to marine habitats while conservation studies on the nesting beaches must be continued.

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