

## The First Green Turtle Nest Documented in Rhodes Island, Greece

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Two sea turtle species, the loggerhead turtle *Caretta caretta* and the green turtle *Chelonia mydas*, reproduce in the eastern Mediterranean. The range of green turtle nesting activity is mostly restricted to the Levantine basin, while the loggerhead turtle nesting activity is widespread with recently increasing nesting events in the western Mediterranean (Mancino et al. 2022). The main reason for the more restricted range shown by green turtles is the seawater temperature profile, since they show a preference for the warmer waters of Levantine basin (Patel et al. 2016). Until 2007, the westernmost green turtle nests were recorded in the Gulf of Fethiye, Turkey (36.74498°N, 28.92486°E) (Sözbilen et al. 2018). The first green turtle nests in Greece were recorded in 2007 in Rethymno, Crete (Margaritoulis et al. 2019), and in 2019 in Messaras Bay, Crete (Margaritoulis et al. 2023), both in the context of the long-term monitoring program of ARCHELON. Further west, outside Greece, green turtle nests were documented in 2019 in Rejich beach, Tunisia (Ben Ismail et al. 2022), and in 2021 in Libya (near Tobruk) (Saied et al. 2023).

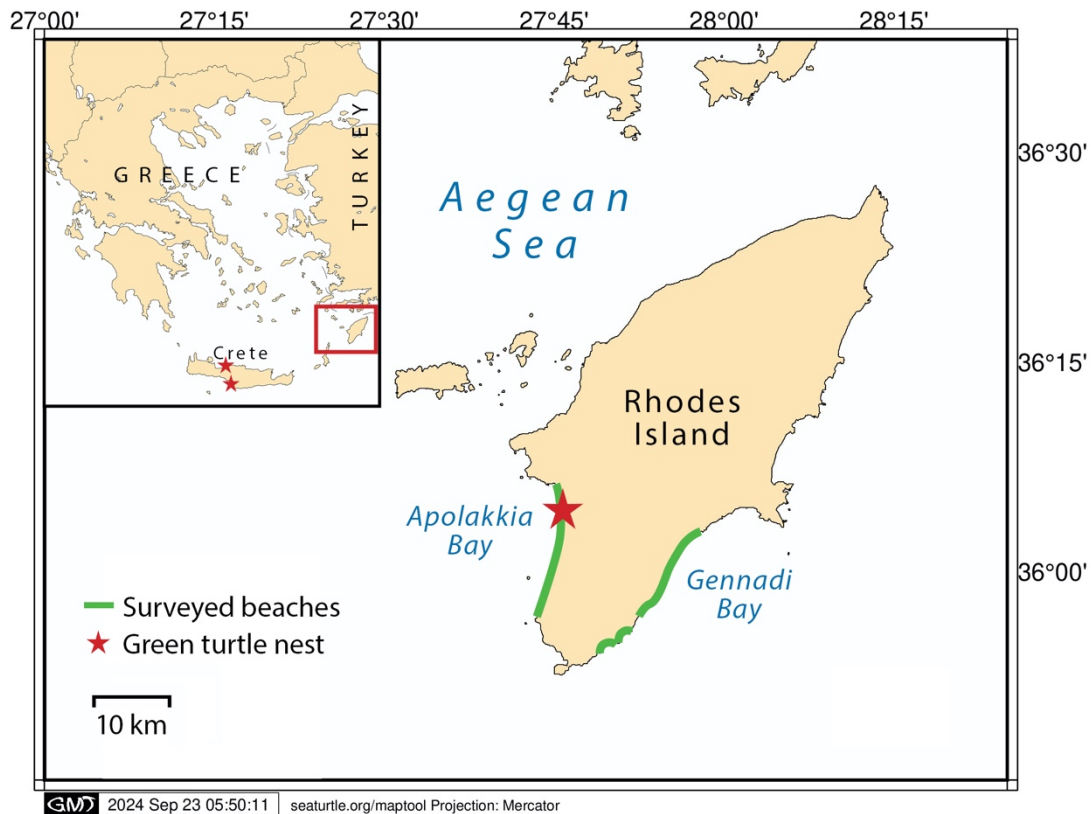
ARCHELON, a non-profit organization, which is devoted to studying and preserving sea turtles and their habitats in Greece, monitors systematically the main nesting areas of loggerhead turtles in Greece (Margaritoulis & Panagopoulou 2010). These areas were selected for regular monitoring of the nesting activity following initial surveys estimating primarily the nesting density and considering additional factors, e.g. accessibility to the site. In the period 1988-1989, ARCHELON surveyed regularly the

beaches in southern Rhodes to assess sea turtle nesting activity. Those surveys indicated that southern Rhodes hosted an average of 15 nests per year (range 9-21 nests/yr), along about 34 km of potential nesting beaches (Margaritoulis 2000). The low nesting density (0.44 nests/km/yr) did not encourage the inclusion of Rhodes in ARCHELON's standard monitoring program.

However, after 35 years, ARCHELON decided to reassess the nesting activity and the current status of the nesting beaches in southern Rhodes (Fig. 1) in the context of the implementation of the National Action Plan for the protection of *Caretta caretta* in Greece (Panagopoulou et al. 2022). The research work was held between 8 and 27 June 2024 (20 days). The beaches were surveyed regularly (every few days) on foot or with the help of an all-terrain vehicle. All encountered turtle tracks (emergences and nests) were recorded and photographed.

On 22 June 2024, an emergence track at the northern section of Apolakkia Bay showed the characteristics of a green turtle track (Fig. 2). Specifically, it differed from a typical loggerhead track; loggerheads use their right and left front and rear flippers separately in an alternating gait when they crawl up and down the beach, leaving asymmetrical tracks. This one was consistent with a track left by a green turtle, as it exhibited symmetrical flipper marks, the result of greens using their left and right flippers simultaneously. In addition, the track exhibited a drag mark through its center, typical of a green turtle track (Fig. 2).





**Figure 1.** Sketch map of Rhodes Island, showing the island's position in the Aegean Sea. Green lines along the coasts show the surveyed beaches in 2024. The locations of the previously documented green turtle nests on Crete are shown in the inset map.

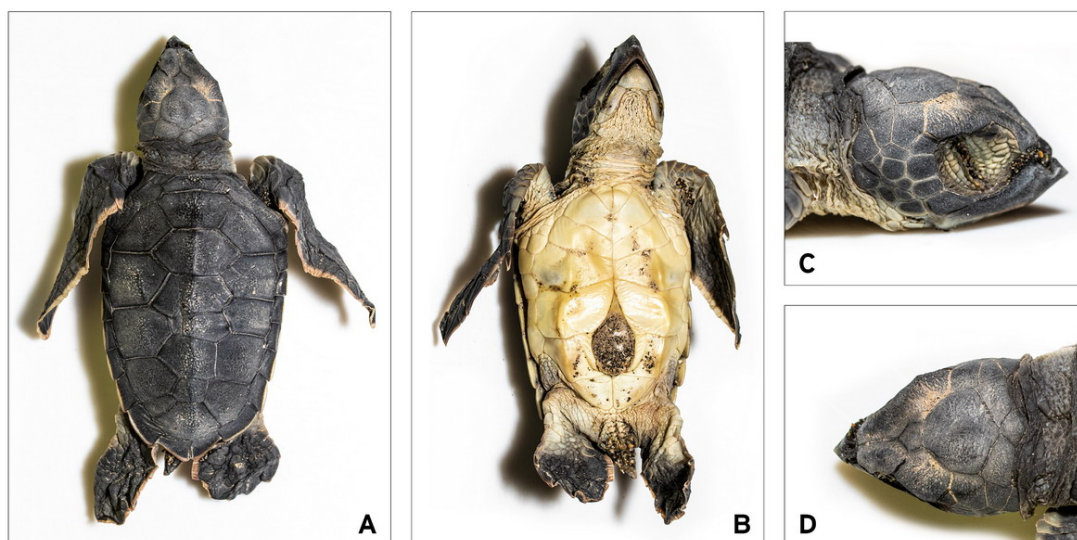


**Figure 2.** The emergence track of green turtle showing the characteristic pattern of the green turtle's locomotion (Photo: K Teneketzi).

The resulting nest, at 28 m from the sea, was at the start of the dune zone (36.09857°N, 27.75771°E). Excavation by hand to verify the location of the egg-chamber revealed the top egg at 42 cm depth. The nest was signposted and fenced with a metal grid to avoid

predation, usually by foxes, and thereafter the site was regularly checked with help from local volunteers, and daily after the 38<sup>th</sup> incubation day. First hatchling track was recorded on 13 August, indicating an incubation period of 52 days. Outside the nest, a dead hatchling was found that had the morphological characters of green turtle, i.e. one pair of pre-frontals, four post-oculars, four infra-marginals, and the colour of plastron was pale yellow (Fig. 3). Although the costals and vertebrales presented an anomaly (additional scutes), the first costals on both sides had no contact with the nuchal scute, another morphological character of the green turtle (Fig. 3). The dead hatchling was preserved in 95% alcohol and was stored at the sample depository of the Hydrobiological Station of Rhodes (voucher No HSR576) for future research.





**Figure 3.** Dead hatchling found outside the nest during the first day of hatchlings' emergence (Photos: K Kalaentzis). A: Dorsal view showing carapacial anomalies (ventrals: 7, costals: 5). B: Ventral view showing four infra-marginals on both sides. C: Four post-oculars. D: One pair of pre-frontals.

Nest excavation, conducted on 17 August 2024, revealed a maximum nest depth of 55 cm and a clutch size of 86 eggs, of which 78 had hatched and 8 had no visible embryos inside. A live hatchling was found inside the nest, which reached the sea by itself (Fig. 4). This hatchling bore the morphological characteristics of a green turtle and had a similar carapacial anomaly with the dead hatchling found outside the nest on 13 August. Anomalies in scutation patterns are common in both loggerhead and green turtles, especially in hatchlings (Ergene et al. 2011). In conclusion, the nest featured a hatching success of 90.7% and a hatchling emergence success of 89.5%.

Apolakkia Bay, in the western coast of Rhodes, is affected by the northerly winds (meltemia) typically predominant in the summer (Fig. 1) and is lacking any significant tourist development. The surveyed 5.3 km beach length at the bay's northern section comprise mostly of sand with pebbles at places and is backed by

low dunes with sparse vegetation (mainly *Juniperus* spp.). Along the length of this beach, besides the reported green turtle nest, seven more loggerhead nests were documented during the survey period (8-27 June). This section is included in the NATURA 2000 network as a Special Zone of Conservation with the code "RODOS: AKRAMYTIS, ARMENISTIS, ATTAVYROS, REMATA KAI THALASSIA ZONI (KARAVOLA-ORMOS GLYFADA) - GR4210005".



**Figure 4.** The live hatchling of the green turtle nest in Apolakkia Bay showed the same carapacial anomaly as the dead hatchling (photo: P Louzidou).







**Figure 5.** General view of Apolakkia Bay showing a loggerhead emergence track with a nest (photo: K Teneketzis).

Of note, on 14 July 2024, 22 days after the herein reported green turtle nesting, volunteers recorded on the same beach section another emergence track with green turtle characteristics, as determined subsequently from photographs. Nevertheless, no egg-chamber was found, nor any hatchlings, from hatching or predation, were observed despite the regular inspection of the nest site for about two months.

This is the first documented green turtle nest in Rhodes Island, and it supplements other green turtle nests outside the known breeding range of *Chelonia mydas* in the Mediterranean. It is probable that the western expansion of *Chelonia mydas* resembles in a way the breeding expansion of *Caretta caretta* in the western Mediterranean, which is attributed to the increase of temperatures due to climate change (Hochscheid et al. 2022).

The recent appearance of green turtle nests in the southeastern parts of Greece (i.e., Crete and Rhodes) was expected because of their proximity to the primary green turtle nesting areas in the Levantine basin. In addition, strandings of adult green turtles are frequent in southeastern Aegean, especially around Rhodes Island (Margaritoulis & Panagopoulou 2010; Corsini-Foka et al. 2013). Further, the case of Rhodes Island, where no systematic

beach surveys are in place and the fact that one green turtle nest was located in the course of a 20-day survey, requires further exploration.

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